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XLVII. *Second Paper concerning the Parallax of the Sun determined from the Observations of the late Transit of Venus, in which this Subject is treated of more at length, and the Quantity of the Parallax more fully ascertained.* By James Short, M.A. and F. R. S.

Read Dec. 8,
1763.

IN the last volume of the Memoirs of the Royal Academy at Paris for the year 1761, there is a Memoir by M. Pingré, who went to the island of Rodrigues, and observed the transit of Venus there; in this memoir M. Pingré endeavours to determine the parallax of the Sun, by the observation of the late transit of Venus, to be $= 10''$. both by the observed durations, the least distance of the centers, and by the internal contact at the egress; and seems to think that there must be some mistake in the observation of Mr. Mason at the Cape of Good Hope, particularly with regard to the difference of longitude between Mr. Mason's observatory and Paris, because by comparing the observation of Mr. Mason at the Cape with the European observations, he finds the parallax of the Sun, from thence resulting, to be between $8''$ and $9''$, consequently differing from the determination by the observation at Rodrigues when compared with the same places. I shall therefore, in this paper, endeavour to prove, beyond all doubt, by a comparison of the observations

Fig. 1.

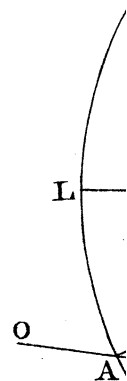
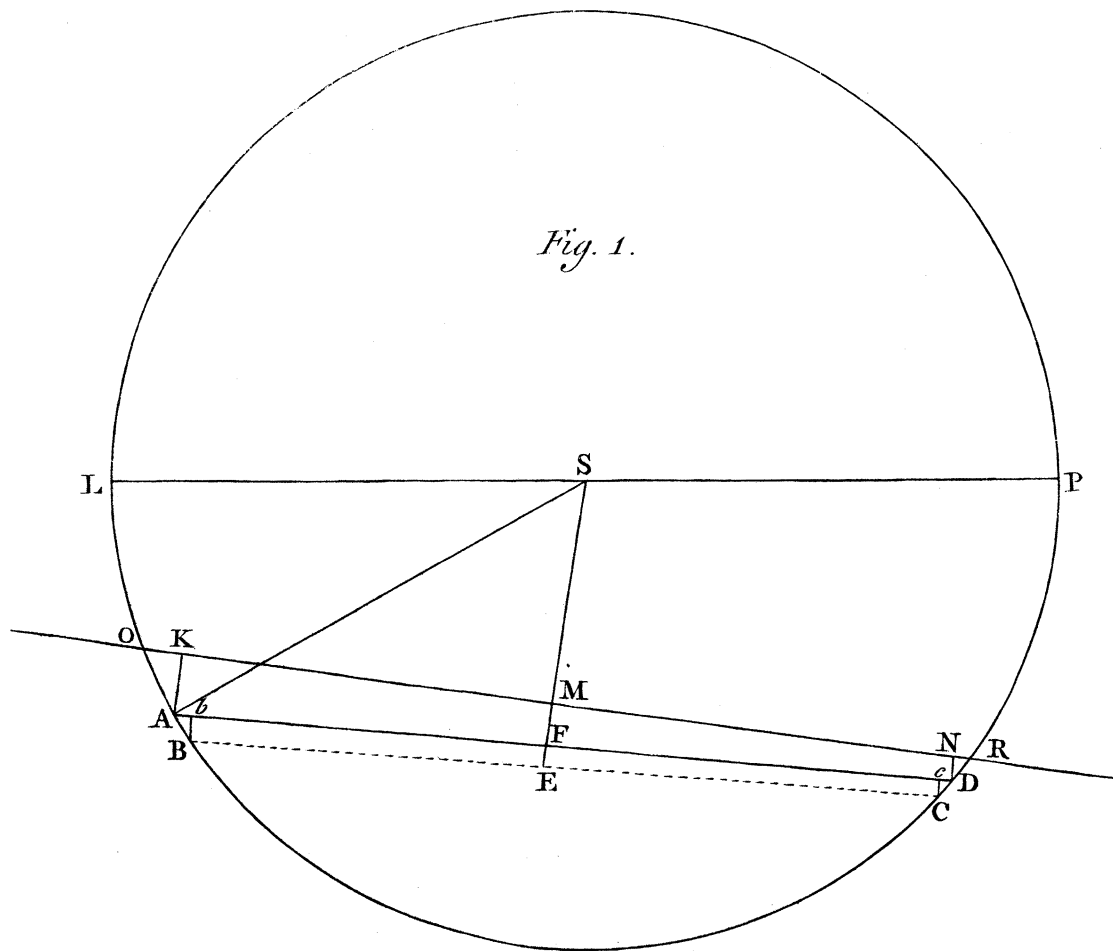
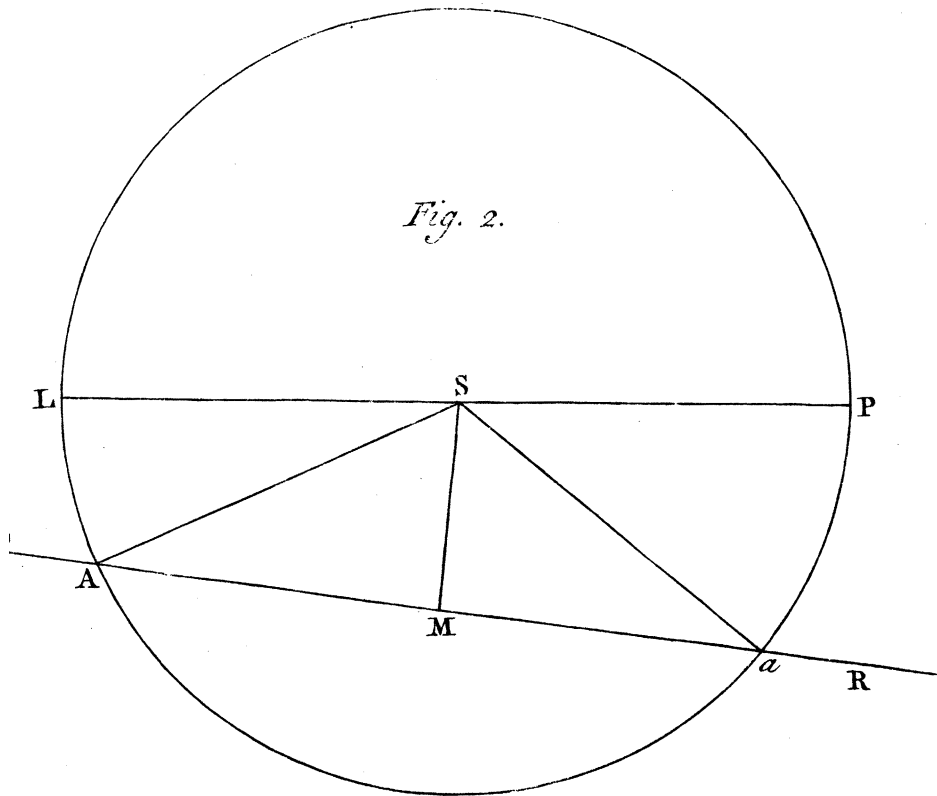


Fig. 2.



observations on this side of the Equinoctial Line alone, that the Sun's parallax is between $8''$ and $9''$, and that this determination is the same or very nearly the same, as when the observation at the Cape is compared with the same places. I shall also endeavour to prove, that there is a mistake of one minute in time in writing down the time of the internal contact at the egress at Rodrigues, and that this being corrected, the results of the Sun's parallax, by a comparison of the observation at Rodrigues with the observations at the several places on this side of the *Line*, is the same with that which results from all the rest; and this agreement is also an argument that there must have been such a mistake in setting down the time of the internal contact at the egress at Rodrigues. I shall also shew that the parallax of the Sun, determined from the observed durations, and from the least distance of the centers is very nearly the same as that which is determined from the internal contact at the egress, though these last determinations cannot be so much depended on because of the minute elements from which they are drawn.

I shall therefore proceed to compare the observations of the internal contact made on this side of the *Line* only, and from thence determine the Sun's parallax. In order to do this it is necessary that the differences of longitude between the places of observation, compared together, be well ascertained: and in the doing of this, in all places where the ingress was observed, I have been much obliged to a very ingenious method, proposed by M. Pingré in his *aforesaid* Memoir, to which I refer; and for the longitudes of other places I have consulted the Philosophical Trans-

actions and the *Connoissance des Temps*. These differences of longitude are as follow.

Tobolsk and Abo - - - - -	=	3	4	37	West.
Bologna - - - - -	=	3	47	46	W.
Calcutta - - - - -	=	1	20	38	East.
Cajaneburg - - - - -	=	2	42	12	W.
Calmar - - - - -	=	3	27	32	W.
Cape of G. Hope =	3	19	32	W.	
Florence - - - - -	=	3	49	3	W.
Gottingen - - - - -	=	3	53	35	W.
Grand Mount - - - - -	=	0	46	26	E.
Greenwich - - - - -	=	4	33	7	W.
Hernofand - - - - -	=	3	21	55	W.
Leskeard - - - - -	=	4	51	39	W.
Madrafs - - - - -	=	0	47	11	E.
Paris - - - - -	=	4	23	51	W.
Rodrigues - - - - -	=	0	20	25	W.
Rome - - - - -	=	3	43	14	W.
* Savile-house, Lond. =	4	33	37	W.	
Stokolm - - - - -	=	3	20	41	W.
Tornea - - - - -	=	2	56	7	W.
Tranquebar - - - - -	=	0	46	9	E.
Upsal - - - - -	=	3	22	40	W.

I have deviated from the above mentioned method of M. Pingré in settling the longitude of Stokolm, by

* The latitude of Savile-house, London, is $= 51^{\circ} 30' 50''$ N. The latitude of Florence is $= 43^{\circ} 46' 30''$ N. and that of Gottingen $= 51^{\circ} 31' 54''$ N. The latitudes of the rest of the places are set down in my former paper on this subject, only that of Tranquebar should be $= 11^{\circ} 30' 0''$.

the

$$\begin{array}{r}
 \begin{array}{l}
 \text{h} \\
 10 \quad 7 \quad 59 \quad \text{Cajan.} \quad 2 \quad 59 \quad \text{C.} \\
 0 \quad 22 \quad 25 = \text{D. M.} \quad 2 \quad 30 \quad \text{A.}
 \end{array} \\
 \hline
 \begin{array}{r}
 9 \quad 45 \quad 34 \\
 9 \quad 45 \quad 59 \quad \text{Abo.}
 \end{array} \\
 \hline
 25
 \end{array}
 \quad
 \begin{array}{l}
 \text{Par.} = 7.33
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{l}
 \text{h} \\
 10 \quad 7 \quad 59 \quad \text{Cajan.} \quad 2 \quad 59 \quad \text{C.} \\
 0 \quad 45 \quad 20 = \text{D. M.} \quad 1 \quad 59 \quad \text{C.}
 \end{array} \\
 \hline
 \begin{array}{r}
 9 \quad 22 \quad 39 \\
 9 \quad 23 \quad 40 \quad \text{Calmar.}
 \end{array} \\
 \hline
 0 \quad 1 \quad 1
 \end{array}
 \quad
 \begin{array}{l}
 \text{Par.} = 8.64
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{l}
 \text{h} \\
 10 \quad 7 \quad 59 \quad \text{Cajan.} \quad 2 \quad 59 \quad \text{C.} \\
 0 \quad 39 \quad 43 = \text{D. M.} \quad 2 \quad 26 \quad \text{H.}
 \end{array} \\
 \hline
 \begin{array}{r}
 9 \quad 28 \quad 16 \\
 9 \quad 28 \quad 52 \quad \text{Hernofand.}
 \end{array} \\
 \hline
 0 \quad 0 \quad 36
 \end{array}
 \quad
 \begin{array}{l}
 \text{Par.} = 9.27
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{l}
 \text{h} \\
 10 \quad 7 \quad 59 \quad \text{Cajan.} \quad 2 \quad 59 \quad \text{C.} \\
 2 \quad 42 \quad 12 = \text{D. M.} \quad 3 \quad 44 \quad \text{T.}
 \end{array} \\
 \hline
 \begin{array}{r}
 12 \quad 50 \quad 11 \\
 12 \quad 49 \quad 23 \quad \text{Tobolsk.}
 \end{array} \\
 \hline
 0 \quad 0 \quad 48
 \end{array}
 \quad
 \begin{array}{l}
 \text{Par.} = 9.06
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{l}
 \text{h} \\
 10 \quad 7 \quad 59 \quad \text{Cajan.} \quad 2 \quad 59 \quad \text{C.} \\
 1 \quad 11 \quad 23 = \text{D. M.} \quad 1 \quad 18 \quad \text{G.}
 \end{array} \\
 \hline
 \begin{array}{r}
 8 \quad 56 \quad 36 \\
 8 \quad 58 \quad 26 \quad \text{Gottingen.}
 \end{array} \\
 \hline
 0 \quad 1 \quad 50
 \end{array}
 \quad
 \begin{array}{l}
 \text{Par.} = 9.25
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{l}
 \text{h} \\
 10 \quad 7 \quad 59 \quad \text{Cajan.} \quad 2 \quad 59 \quad \text{C.} \\
 1 \quad 50 \quad 55 = \text{D. M.} \quad 1 \quad 12 \quad \text{G.}
 \end{array} \\
 \hline
 \begin{array}{r}
 8 \quad 17 \quad 4 \\
 8 \quad 19 \quad 0 \quad \text{Greenwich.}
 \end{array} \\
 \hline
 0 \quad 1 \quad 56
 \end{array}
 \quad
 \begin{array}{l}
 \text{Par.} = 9.09
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{l}
 \text{h} \\
 10 \quad 7 \quad 59 \quad \text{Cajan.} \quad 2 \quad 59 \quad \text{C.} \\
 1 \quad 51 \quad 25 = \text{D. M.} \quad 1 \quad 11 \quad \text{S.H.}
 \end{array} \\
 \hline
 \begin{array}{r}
 8 \quad 16 \quad 34 \\
 8 \quad 18 \quad 22 \quad \text{Savile-houfe.}
 \end{array} \\
 \hline
 0 \quad 1 \quad 48
 \end{array}
 \quad
 \begin{array}{l}
 \text{Par.} = 8.50
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{l}
 \text{h} \\
 10 \quad 7 \quad 59 \quad \text{Cajan.} \quad 2 \quad 59 \quad \text{C.} \\
 2 \quad 9 \quad 27 = \text{D. M.} \quad 1 \quad 4 \quad \text{L.}
 \end{array} \\
 \hline
 \begin{array}{r}
 7 \quad 58 \quad 32 \\
 8 \quad 0 \quad 21 \quad \text{Lefkeard.}
 \end{array} \\
 \hline
 0 \quad 1 \quad 49
 \end{array}
 \quad
 \begin{array}{l}
 \text{Par.} = 8.06
 \end{array}$$

$$\begin{array}{r}
 \overset{h}{10} \quad \overset{'}{7} \quad \overset{''}{59} \quad \text{Cajan.} \quad \overset{'}{2} \quad \overset{''}{59} \text{ C.} \\
 \underline{1 \quad 41 \quad 39} = \text{D. M.} \quad \underline{0 \quad 53 \text{ P.}} \\
 \\
 \underline{9 \quad 26 \quad 20} \quad \quad \quad \underline{2 \quad 6} \\
 \underline{9 \quad 28 \quad 25} \text{ Paris.} \\
 \\
 \underline{0 \quad 2 \quad 5} \quad \quad \quad \text{Par.} = 8''.43
 \end{array}$$

$$\begin{array}{r}
 \overset{h}{10} \quad \overset{'}{7} \quad \overset{''}{59} \quad \text{Cajan.} \quad \overset{'}{2} \quad \overset{''}{59} \text{ C.} \\
 \underline{1 \quad 5 \quad 34} = \text{D. M.} \quad \underline{0 \quad 29 \text{ B.}} \\
 \\
 \underline{9 \quad 2 \quad 25} \quad \quad \quad \underline{2 \quad 30} \\
 \underline{9 \quad 4 \quad 54} \text{ Bologna.} \\
 \\
 \underline{0 \quad 2 \quad 29} \quad \quad \quad \text{Par.} = 8''.44
 \end{array}$$

$$\begin{array}{r}
 \overset{h}{10} \quad \overset{'}{7} \quad \overset{''}{59} \quad \text{Cajan.} \quad \overset{'}{2} \quad \overset{''}{59} \text{ C.} \\
 \underline{1 \quad 1 \quad 2} = \text{D. M.} \quad \underline{0 \quad 13 \text{ R.}} \\
 \\
 \underline{9 \quad 6 \quad 57} \quad \quad \quad \underline{2 \quad 46} \\
 \underline{9 \quad 9 \quad 36} \text{ Rome.} \\
 \\
 \underline{0 \quad 2 \quad 39} \quad \quad \quad \text{Par.} = 8''.14
 \end{array}$$

$$\begin{array}{r}
 \overset{h}{10} \quad \overset{'}{7} \quad \overset{''}{59} \quad \text{Cajan.} \quad \overset{'}{2} \quad \overset{''}{59} \text{ C.} \\
 \underline{1 \quad 6 \quad 51} = \text{D. M.} \quad \underline{0 \quad 24 \text{ F.}} \\
 \\
 \underline{9 \quad 1 \quad 8} \quad \quad \quad \underline{2 \quad 35} \\
 \underline{9 \quad 3 \quad 28} \text{ Florence.} \\
 \\
 \underline{0 \quad 2 \quad 20} \quad \quad \quad \text{Par.} = 7''.68
 \end{array}$$

$$\begin{array}{r}
 \overset{h}{10} \quad \overset{'}{7} \quad \overset{''}{59} \quad \text{Cajan.} \quad \overset{'}{2} \quad \overset{''}{59} \text{ C.} \\
 \underline{4 \quad 2 \quad 50} = \text{D. M.} \quad \underline{2 \quad 22 \text{ C.}} \\
 \\
 \underline{14 \quad 10 \quad 49} \quad \quad \quad \underline{0 \quad 37} \\
 \underline{14 \quad 11 \quad 34} \text{ Calcutta.} \\
 \\
 \underline{0 \quad 0 \quad 45} \quad \quad \quad \text{Par.} = 10''.34
 \end{array}$$

$$\begin{array}{r}
 \overset{h}{10} \quad \overset{'}{7} \quad \overset{''}{59} \quad \text{Cajan.} \quad \overset{'}{2} \quad \overset{''}{59} \text{ C.} \\
 \underline{3 \quad 28 \quad 38} = \text{D. M.} \quad \underline{1 \quad 0 \text{ G. M.}} \\
 \\
 \underline{13 \quad 36 \quad 37} \quad \quad \quad \underline{1 \quad 59} \\
 \underline{13 \quad 38 \quad 30} \text{ G. Mount.} \\
 \\
 \underline{0 \quad 1 \quad 53} \quad \quad \quad \text{Par.} = 8''.07
 \end{array}$$

$$\begin{array}{r}
 \overset{h}{10} \quad \overset{'}{7} \quad \overset{''}{59} \quad \text{Cajan.} \quad \overset{'}{2} \quad \overset{''}{59} \text{ C.} \\
 \underline{3 \quad 28 \quad 21} = \text{D. M.} \quad \underline{0 \quad 52 \text{ T.}} \\
 \\
 \underline{13 \quad 36 \quad 20} \quad \quad \quad \underline{2 \quad 7} \\
 \underline{13 \quad 38 \quad 25} \text{ Tranquebar.} \\
 \\
 \underline{0 \quad 2 \quad 5} \quad \quad \quad \text{Par.} = 8''.36
 \end{array}$$

$$\begin{array}{r}
 \overset{h}{10} \quad \overset{'}{7} \quad \overset{''}{59} \quad \text{Cajan.} \quad \overset{'}{2} \quad \overset{''}{59} \text{ C.} \\
 \underline{3 \quad 29 \quad 23} = \text{D. M.} \quad \underline{1 \quad 0 \text{ M.}} \\
 \\
 \underline{13 \quad 37 \quad 22} \quad \quad \quad \underline{1 \quad 59} \\
 \underline{13 \quad 39 \quad 38} \text{ Madrafs.} \\
 \\
 \underline{0 \quad 2 \quad 16} \quad \quad \quad \text{Par.} = 9''.71
 \end{array}$$

[306]

h 9 4 54 Bologna ó 29 B. 0 27 5 = D. M. 2 18 S.	h 9 4 54 Bologna ó 29 B. 0 25 5 = D. M. 2 21 Up.
9 31 59 I 49 9 30 8 Stokolm.	9 29 59 I 52 9 28 9 Upfal.
0 1 51 Par. = 8. 65	0 1 50 Par. = 8. 35

h 9 4 54 Bologna ó 29 B. 0 43 9 = D. M. 2 30 A.	h 9 4 54 Bologna ó 29 B. 0 20 14 = D. M. 1 59 C.
9 48 3 2 I 9 45 59 Abo.	9 25 8 I 30 9 23 40 Calmar.
0 2 4 Par = 8. 71	0 1 28 Par. = 8. 31

h 9 4 56 Bologna ó 29 B. 0 25 51 = D. M. 2 26 H.	h 9 4 54 Bologna ó 29 B. 3 47 46 = D. M. 3 44 T.
2 30 47 I 57 9 28 52 Hernofand.	12 52 40 3 15 12 49 23 Tobolsk.
0 1 55 Par. = 8. 36	0 3 17 Par. = 8. 58

h 9 5 0 Bologna ó 29 B. 0 5 49 = D. M. 1 18 G.	h 9 5 0 Bologna ó 29 B. 0 45 21 = D. M. 1 12 G.
8 59 11 0 49 8 58 26 Gottingen.	8 19 39 0 43 8 19 0 Greenwich.
0 0 45 Par. = 7. 80	0 0 39 Par. = 7. 71

$$\begin{array}{r}
 \begin{array}{r}
 \overset{h}{9} \quad \overset{4}{4} \quad \overset{54}{54} \text{ Bologna } \overset{0}{0} \quad \overset{29}{29} \text{ B.} \\
 \overset{0}{0} \quad \overset{45}{45} \quad \overset{51}{51} = \text{D. M. } \overset{1}{1} \quad \overset{11}{11} \text{ S. H.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{8}{8} \quad \overset{19}{19} \quad \overset{3}{3} \quad \overset{0}{0} \quad \overset{42}{42} \\
 \overset{8}{8} \quad \overset{18}{18} \quad \overset{22}{22} \text{ Savile-Houfe.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{0}{0} \quad \overset{0}{0} \quad \overset{41}{41}
 \end{array}
 \end{array}$$

Par. = 8". 30

$$\begin{array}{r}
 \begin{array}{r}
 \overset{h}{9} \quad \overset{4}{4} \quad \overset{54}{54} \text{ Bologna } \overset{0}{0} \quad \overset{29}{29} \text{ B.} \\
 \overset{1}{1} \quad \overset{3}{3} \quad \overset{53}{53} = \text{D. M. } \overset{1}{1} \quad \overset{4}{4} \text{ L.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{8}{8} \quad \overset{1}{1} \quad \overset{1}{1} \quad \overset{0}{0} \quad \overset{35}{35} \\
 \overset{8}{8} \quad \overset{0}{0} \quad \overset{21}{21} \text{ Leafkeard.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{0}{0} \quad \overset{0}{0} \quad \overset{40}{40}
 \end{array}
 \end{array}$$

Par. = 9". 71

$$\begin{array}{r}
 \begin{array}{r}
 \overset{h}{9} \quad \overset{4}{4} \quad \overset{54}{54} \text{ Bologna } \overset{0}{0} \quad \overset{29}{29} \text{ B.} \\
 \overset{0}{0} \quad \overset{36}{36} \quad \overset{5}{5} = \text{D. M. } \overset{0}{0} \quad \overset{53}{53} \text{ P.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{8}{8} \quad \overset{28}{28} \quad \overset{49}{49} \quad \overset{0}{0} \quad \overset{24}{24} \\
 \overset{8}{8} \quad \overset{28}{28} \quad \overset{25}{25} \text{ Paris.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{0}{0} \quad \overset{0}{0} \quad \overset{24}{24}
 \end{array}
 \end{array}$$

Par. = 8". 50

$$\begin{array}{r}
 \begin{array}{r}
 \overset{h}{9} \quad \overset{5}{5} \quad \overset{0}{0} \text{ Bologna } \overset{0}{0} \quad \overset{29}{29} \text{ B.} \\
 \overset{5}{5} \quad \overset{8}{8} \quad \overset{24}{24} = \text{D. M. } \overset{2}{2} \quad \overset{22}{22} \text{ C.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{14}{14} \quad \overset{13}{13} \quad \overset{24}{24} \quad \overset{1}{1} \quad \overset{53}{53} \\
 \overset{14}{14} \quad \overset{11}{11} \quad \overset{34}{34} \text{ Calcutta.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{0}{0} \quad \overset{1}{1} \quad \overset{50}{50}
 \end{array}
 \end{array}$$

Par. = 8". 28

$$\begin{array}{r}
 \begin{array}{r}
 \overset{h}{9} \quad \overset{4}{4} \quad \overset{54}{54} \text{ Bologna } \overset{0}{0} \quad \overset{29}{29} \text{ B.} \\
 \overset{4}{4} \quad \overset{34}{34} \quad \overset{12}{12} = \text{D. M. } \overset{1}{1} \quad \overset{0}{0} \text{ G. M.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{13}{13} \quad \overset{39}{39} \quad \overset{6}{6} \quad \overset{0}{0} \quad \overset{31}{31} \\
 \overset{13}{13} \quad \overset{38}{38} \quad \overset{30}{30} \text{ G. Mount.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{0}{0} \quad \overset{0}{0} \quad \overset{36}{36}
 \end{array}
 \end{array}$$

Par. = 9". 87

$$\begin{array}{r}
 \begin{array}{r}
 \overset{h}{9} \quad \overset{4}{4} \quad \overset{54}{54} \text{ Bologna } \overset{0}{0} \quad \overset{29}{29} \text{ B.} \\
 \overset{4}{4} \quad \overset{33}{33} \quad \overset{55}{55} = \text{D. M. } \overset{0}{0} \quad \overset{52}{52} \text{ T.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{13}{13} \quad \overset{38}{38} \quad \overset{49}{49} \quad \overset{0}{0} \quad \overset{23}{23} \\
 \overset{13}{13} \quad \overset{38}{38} \quad \overset{25}{25} \text{ Tranquebar.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{0}{0} \quad \overset{0}{0} \quad \overset{24}{24}
 \end{array}
 \end{array}$$

Par. = 8". 86

$$\begin{array}{r}
 \begin{array}{r}
 \overset{h}{9} \quad \overset{5}{5} \quad \overset{0}{0} \text{ Bologna } \overset{0}{0} \quad \overset{29}{29} \text{ B.} \\
 \overset{4}{4} \quad \overset{34}{34} \quad \overset{59}{59} = \text{D. M. } \overset{1}{1} \quad \overset{0}{0} \text{ M.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{13}{13} \quad \overset{39}{39} \quad \overset{59}{59} \quad \overset{0}{0} \quad \overset{31}{31} \\
 \overset{13}{13} \quad \overset{39}{39} \quad \overset{38}{38} \text{ Madrafs.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{0}{0} \quad \overset{0}{0} \quad \overset{21}{21}
 \end{array}
 \end{array}$$

Par. = 5". 76

$$\begin{array}{r}
 \begin{array}{r}
 \overset{h}{9} \quad \overset{5}{5} \quad \overset{0}{0} \text{ Bologna } \overset{0}{0} \quad \overset{29}{29} \text{ B.} \\
 \overset{0}{0} \quad \overset{51}{51} \quad \overset{39}{39} = \text{D. M. } \overset{3}{3} \quad \overset{5}{5} \text{ T.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{9}{9} \quad \overset{56}{56} \quad \overset{39}{39} \quad \overset{2}{2} \quad \overset{36}{36} \\
 \overset{9}{9} \quad \overset{54}{54} \quad \overset{8}{8} \text{ Tornea.}
 \end{array} \\
 \hline
 \begin{array}{r}
 \overset{0}{0} \quad \overset{2}{2} \quad \overset{31}{31}
 \end{array}
 \end{array}$$

Par. = 8". 23

[308]

^h
12 49 23 Tobolsk 3 44 T.
3 20 41 = D. M. 2 18 S.

9 28 42 I 26
9 30 8 Stokolm.

0 I 26

Par. = 8. 50

^h
12 49 23 Tobolsk 3 44 T.
3 22 40 = D. M. 2 21 U.

9 26 43 I 23
9 28 9 Upsal.

0 I 26

Par. = 8. 80

^h
12 49 23 Tobolsk 3 44 T.
3 4 37 = D. M. 2 30 A.

9 44 46 I 14
9 45 59 Abo.

0 I 13

Par. = 8. 40

^h
12 49 23 Tobolsk 3 44 T.
3 27 32 = D. M. 1 59 C.

9 21 51 I 45
9 23 40 Calmar.

0 I 49

Par. = 8. 82

^h
12 49 23 Tobolsk 3 44 T.
3 21 55 = D. M. 2 26 H.

9 27 28 I 18
9 28 52 Hernofand.

0 I 24

Par. = 9. 02

^h
12 49 23 Tobolsk 3 44 T.
3 53 35 = D. M. 1 18 G.

8 55 48 2 26
8 58 26 Gottingen.

0 2 38

Par. = 10. 57

^h
12 49 23 Tobolsk 3 44 T.
4 33 7 = D. M. 1 12 G.

8 16 16 2 32
8 19 0 Greenwich.

0 2 44

Par. = 9. 11

^h
12 49 23 Tobolsk 3 44 T.
4 33 37 = D. M. 1 11 S. H.

8 15 46 2 33
8 18 22 Savile-Houfe.

0 2 36

Par. = 8. 66

h
12 49 23 Tobolsk 3 44 T.
4 51 39 = D. M. 1 4 L.

7 57 44 2 40
8 0 21 Leskeard.

0 2 37
Par. = 8. 34

h
12 49 23 Tobolsk 3 44 T.
4 23 51 = D. M. 0 53 P.

8 25 32 2 51
8 28 25 Paris.

0 2 53
Par. = 8. 60

h
12 49 23 Tobolsk 3 44 T.
3 49 3 = D. M. 0 24 F.

9 0 20 3 20
9 3 28 Florence.

0 3 8
Par. = 7. 99

h
12 49 23 Tobolsk 3 44 T.
3 43 14 = D. M. 0 13 R.

9 6 9 3 31
9 9 36 Rome.

0 3 27
Par. = 8. 34

h
12 49 23 Tobolsk 3 44 T.
1 20 38 = D. M. 2 22 C.

14 10 1 1 22
14 11 34 Calcutta.

0 1 33
Par. = 9. 64

h
12 49 23 Tobolsk 3 44 T.
0 46 26 = D. M. 1 0 G. M.

13 35 49 2 44
13 38 30 G. Mount.

0 2 41
Par. = 8. 34

h
12 49 23 Tobolsk 3 44 T.
0 46 9 = D. M. 0 52 Tr.

13 35 32 2 52
13 38 25 Tranquebar

0 2 53
Par. = 8. 55

h
12 49 23 Tobolsk 3 44 T.
0 47 11 = D. M. 1 0 M.

13 36 34 2 44
12 39 38 Madrafs.

0 3 4
Par = 9. 54

I have explained the manner of this table in a former paper on this subject to which I refer. I shall now set down the result from each comparison in the following order, that they may be the more easily seen.

Sun's Parallax.	Sun's Parallax.	Sun's Parallax.
Cajan, and Stokolm = 8. 50	Bolog. and Stokolm = 8. 65	Tobolsk and Stokolm = 8. 50
Upsal - - = 8. 50	Upsal - - = 8. 35	Upsal - - = 8. 80
Abo - - = 7. 33	Abo - - = 8. 71	Abo - - = 8. 40
Calmar - = 8. 64	Calmar - = 8. 31	Calmar - = 8. 82
Hernofand - = 9. 27	Hernofand = 8. 36	Hernofand - = 9. 02
Tobolsk - = 9. 06	Tobolsk - = 8. 58	Göttingen = 10. 57
Göttingen - = 9. 25	Göttingen = 7. 80	Greenwich = 9. 11
Greenwich - = 9. 09	Greenwich = 7. 71	Savile-House = 8. 66
Savile-House = 8. 50	Savile-House = 8. 30	Lefkeard - = 8. 34
Lefkeard - = 8. 06	Lefkeard - = 9. 71	Paris - - = 8. 60
Paris - - = 8. 43	Paris - - = 8. 50	Florence - = 7. 99
Bologna - = 8. 44	Calcutta - = 8. 28	Bologna - = 8. 58
Rome - - = 8. 14	G. Mount = 9. 87	Rome - - = 8. 34
Florence - = 7. 68	Tranquebar = 8. 86	Calcutta - = 9. 64
Calcutta - = 10. 34	Madras - = 5. 76	G. Mount - = 8. 34
G. Mount = 8. 07	Cajaneburg = 8. 44	Tranquebar = 8. 55
Tranquebar = 8. 36	Tornea - = 8. 23	Madras - = 9. 54
Madras - = 9. 71		Cajaneburg = 9. 07

The mean of these 53 comparisons gives the Sun's Parallax = 8'', 61.

Rejecting all those results which differ more than one second from the mean of the whole, the mean of the remaining 45 results gives the Sun's parallax = 8'', 55.

Rejecting all those results which differ more than half a second from the mean of the whole, the mean of the remaining 37 results gives the Sun's parallax = 8'', 57.

The mean of these three means gives the Sun's parallax = 8'', 58.

I shall next compare the observations of the internal contact at the egress made at Paris, Greenwich, Savile-House, Bologna, Madras, Grand Mount, and Tranquebar, with those made at Stokolm, Upsal, Tornea,

Tornea, Cajaneburg, Tobolsk, Abo, Calmar, Hernofand and Calcutta. They are as in the following table.

$\begin{array}{r} \text{h} \\ 9 \text{ } 28 \text{ } 52 \text{ } \text{Hernofand } 2 \text{ } 26 \text{ } \text{H.} \\ 4 \text{ } 8 \text{ } 4 = \text{D. M. } 0 \text{ } 51 \text{ } \text{T.} \\ \hline 13 \text{ } 36 \text{ } 56 \text{ } \text{I } 35 \\ 13 \text{ } 38 \text{ } 25 \text{ } \text{Tranquebar.} \\ \hline 0 \text{ } 1 \text{ } 29 \\ \text{Par.} = 7. \text{ } 96 \end{array}$	$\begin{array}{r} \text{h} \\ 14 \text{ } 11 \text{ } 34 \text{ } \text{Calcutta } 2 \text{ } 22 \text{ } \text{C.} \\ 0 \text{ } 34 \text{ } 29 = \text{D. M. } 0 \text{ } 51 \text{ } \text{T.} \\ \hline 13 \text{ } 37 \text{ } 5 \text{ } \text{I } 31 \\ 13 \text{ } 38 \text{ } 25 \text{ } \text{Tranquebar.} \\ \hline 0 \text{ } 1 \text{ } 20 \\ \text{Par.} = 7. \text{ } 47 \end{array}$
$\begin{array}{r} \text{h} \\ 8 \text{ } 28 \text{ } 27 \text{ } \text{Paris } 0 \text{ } 53 \text{ } \text{P.} \\ 1 \text{ } 3 \text{ } 10 = \text{D. M. } 2 \text{ } 18 \text{ } \text{S.} \\ \hline 9 \text{ } 31 \text{ } 37 \text{ } \text{I } 25 \\ 9 \text{ } 30 \text{ } 10 \text{ } \text{Stokolm.} \\ \hline 0 \text{ } 1 \text{ } 27 \\ \text{Par.} = 8. \text{ } 70 \end{array}$	$\begin{array}{r} \text{h} \\ 8 \text{ } 28 \text{ } 27 \text{ } \text{Paris } 0 \text{ } 53 \text{ } \text{P.} \\ 1 \text{ } 1 \text{ } 11 = \text{D. M. } 2 \text{ } 21 \text{ } \text{U.} \\ \hline 9 \text{ } 29 \text{ } 38 \text{ } \text{I } 28 \\ 9 \text{ } 28 \text{ } 9 \text{ } \text{Upsal.} \\ \hline 0 \text{ } 1 \text{ } 29 \\ \text{Par.} = 8. \text{ } 60 \end{array}$
$\begin{array}{r} \text{h} \\ 8 \text{ } 28 \text{ } 27 \text{ } \text{Paris } 0 \text{ } 53 \text{ } \text{P.} \\ 1 \text{ } 27 \text{ } 44 = \text{D. M. } 3 \text{ } 5 \text{ } \text{T.} \\ \hline 9 \text{ } 56 \text{ } 11 \text{ } 2 \text{ } 12 \\ 9 \text{ } 54 \text{ } 8 \text{ } \text{Tornea.} \\ \hline 0 \text{ } 2 \text{ } 3 \\ \text{Par.} = 7. \text{ } 92 \end{array}$	$\begin{array}{r} \text{h} \\ 8 \text{ } 28 \text{ } 27 \text{ } \text{Paris } 0 \text{ } 53 \text{ } \text{P.} \\ 1 \text{ } 19 \text{ } 14 = \text{D. M. } 2 \text{ } 29 \text{ } \text{A.} \\ \hline 9 \text{ } 47 \text{ } 41 \text{ } \text{I } 36 \\ 9 \text{ } 45 \text{ } 59 \text{ } \text{Abo.} \\ \hline 0 \text{ } 1 \text{ } 42 \\ \text{Par.} = 9. \text{ } 03 \end{array}$
$\begin{array}{r} \text{h} \\ 8 \text{ } 28 \text{ } 27 \text{ } \text{Paris } 0 \text{ } 53 \text{ } \text{P.} \\ 0 \text{ } 56 \text{ } 19 = \text{D. M. } 1 \text{ } 58 \text{ } \text{C.} \\ \hline 9 \text{ } 24 \text{ } 46 \text{ } \text{I } 5 \\ 9 \text{ } 23 \text{ } 40 \text{ } \text{Calmar.} \\ \hline 0 \text{ } 1 \text{ } 6 \\ \text{Par.} = 8. \text{ } 63 \end{array}$	$\begin{array}{r} \text{h} \\ 8 \text{ } 28 \text{ } 27 \text{ } \text{Paris } 0 \text{ } 53 \text{ } \text{P.} \\ 1 \text{ } 1 \text{ } 56 = \text{D. M. } 2 \text{ } 26 \text{ } \text{H.} \\ \hline 9 \text{ } 30 \text{ } 23 \text{ } \text{I } 33 \\ 9 \text{ } 28 \text{ } 52 \text{ } \text{Hernofand.} \\ \hline 0 \text{ } 1 \text{ } 31 \\ \text{Par.} = 8. \text{ } 42 \end{array}$

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h 8 28 27 Paris 0 53 P. 5 44 29 = D. M. 2 22 C.	h 9 30 11 Stokolm 2 18 S. 1 12 26 = D. M. 1 12 G.
14 12 56 14 11 34 Calcutta.	8 17 45 8 19 0 Greenwich.
0 1 22 Par. = 7. 83	0 1 15 Par. = 9. 66

h 9 28 9 Upfal 2 21 U. 1 10 27 = D. M. 1 12 G.	h 9 54 8 Tornea 3 5 T. 1 37 0 = D. M. 1 12 G.
8 17 42 8 19 0 Greenwich.	8 17 8 8 19 0 Greenwich.
0 1 18 Par. = 9. 61	0 1 52 Par. = 8. 42

h 9 45 59 Abo 2 29 A. 1 28 30 = D. M. 1 12 G.	h 9 23 40 Calmar 1 58 C. 1 5 35 = D. M. 1 12 G.
8 17 29 8 19 0 Greenwich.	8 18 5 8 19 0 Greenwich.
0 1 31 Par. = 10. 04	0 0 55 Par. = 10. 16

h 9 28 52 Hernofand 2 26 H. 1 11 12 = D. M. 1 12 G.	h 14 11 34 Calcutta 2 22 C. 5 53 45 = D. M. 1 12 G.
8 17 40 8 19 0 Greenwich.	8 17 49 8 19 0 Greenwich.
0 1 20 Par. = 9. 20	0 1 11 Par. = 8. 62

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^h 9 30 11 Stokolm 2 18 S. 1 12 56 = D.M. 1 11 S.H. <hr/> 8 17 15 1 7 8 18 22 Savile-Houfe. <hr/> 0 1 7 Par. = 8. 50	^h 9 28 9 Upsal 2 21 U. 1 10 57 = D.M. 1 11 S.H. <hr/> 8 17 12 1 10 8 18 22 Savile-Houfe. <hr/> 0 1 10 Par. = 8. 50
^h 9 54 8 Tornea 3 5 T. 1 37 30 = D.M. 1 11 S.H. <hr/> 8 16 38 1 54 8 18 22 Savile-Houfe. <hr/> 0 1 44 Par. = 7. 75	^h 9 45 59 Abo 2 29 A. 1 29 0 = D.M. 1 11 S.H. <hr/> 8 16 59 1 18 8 18 22 Savile-Houfe. <hr/> 0 1 23 Par. = 9. 04
^h 9 23 40 Calmar 1 58 C. 1 6 5 = D.M. 1 11 S.H. <hr/> 8 17 35 0 47 8 18 22 Savile-Houfe. <hr/> 0 0 47 Par. = 8. 50	^h 9 28 52 Hernofand 2 26 H. 1 11 42 = D.M. 1 11 S.H. <hr/> 8 17 10 1 15 8 18 22 Savile-Houfe. <hr/> 0 1 12 Par. = 8. 16
^h 14 11 34 Calcutta 2 22 C. 5 54 15 = D.M. 1 11 S.H. <hr/> 8 17 19 1 11 8 18 22 Savile-houfe. <hr/> 0 1 3 Par. = 7. 54	^h 9 30 10 Stokolm 2 18 S. 4 7 52 = D.M. 0 59 M. <hr/> 13 38 2 1 19 13 39 38 Madrafs. <hr/> 0 1 36 Par. = 10. 33

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^h
 9 28 9 Upfal 2 21 U.
 4 9 51 = D. M. 0 50 M.

13 38 0
 13 39 38 Madrafs.

0 1 38

Par. = 10. 15

^h
 9 54 8 Tornea 3 5 T.
 3 43 18 = D. M. 0 59 M.

13 37 26
 13 39 38 Madrafs.

0 2 12

Par. = 8. 90

^h
 9 45 59 Abo 2 29 A.
 3 51 48 = D. M. 0 59 M.

13 37 47
 13 39 38 Madrafs.

0 1 51

Par. = 10. 48

^h
 9 23 40 Calmar 1 58 C.
 4 14 43 = D. M. 0 59 M.

13 38 23
 13 39 38 Madrafs.

0 1 15

Par. = 10. 80

^h
 9 28 52 Hernofand 2 26 H.
 4 9 6 = D. M. 0 59 M.

13 37 58
 13 39 38 Madrafs.

0 1 40

Par. = 9. 77

^h
 14 11 34 Calcutta 2 22 C.
 0 33 27 = D. M. 0 59 M.

13 38 7
 13 39 38 Madrafs.

0 1 31

Par. = 9. 32

^h
 9 30 8 Stokolm 2 18 S.
 4 7 7 = D. M. 0 59 G. M.

13 37 15
 13 38 30 G. Mount.

0 1 15

Par. = 8. 07

^h
 9 28 9 Upfal 2 21 U.
 4 9 6 = D. M. 0 59 G. M.

13 37 15
 13 38 30 G. Mount.

0 1 15

Par. = 7. 77

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^h
9 54 8 Tornea 3 5 T.
3 42 33 = D.M. 0 59 G.M.

13 36 41 2 6
13 38 30 G. Mount.

0 1 49

Par. = 7. 35

^h
9 45 59 Abo 2 29 A.
3 51 3 = D.M. 0 59 G.M.

13 37 2 1 30
13 38 30 G. Mount.

0 1 28

Par. = 8 31

^h
9 23 40 Calmar 1 58 C.
4 13 58 = D.M. 0 59 G.M.

13 37 38 0 59
13 38 30 G. Mount.

0 0 52

Par. = 7. 50

^h
9 28 52 Hernof. 2 26 H.
4 8 21 = D.M. 0 59 G.M.

13 37 13 1 27
13 38 30 G. Mount.

0 1 17

Par. = 7. 52

^h
14 11 34 Calcutta 2 22 C.
0 34 12 = D.M. 0 59 G.M.

13 37 22 1 23
13 38 30 G. Mount.

0 1 8

Par. = 6. 96

^h
9 30 8 Stokolm 2 18 S.
4 6 50 = D.M. 0 51 T.

13 36 58 1 27
13 38 25 Tranquebar.

0 1 27

Par. = 8. 50

^h
9 28 9 Upfal 2 21 U.
4 8 49 = D.M. 0 51 T.

12 36 58 1 30
13 38 25 Tranquebar.

0 1 27

Par. = 8. 23

^h
9 54 8 Tornea 3 5 T.
3 42 16 = D.M. 0 51 T.

13 36 24 2 14
13 38 25 Tranquebar.

0 2 1

Par. = 7. 68

$$\begin{array}{r} h \\ 9 \text{ } ^\circ 45' 59'' \text{ Abo } 2 \text{ } ^\circ 29' \text{ A.} \\ 3 \text{ } 50' 46'' = \text{D. M. } 0 \text{ } 51' \text{ T.} \end{array}$$

$$\begin{array}{r} 13 \text{ } 36' 45'' \\ 13 \text{ } 38' 25'' \end{array} \text{ Tranquebar.}$$

$$0 \text{ } 1' 40''$$

$$\text{Par.} = 8''.67$$

$$\begin{array}{r} h \\ 9 \text{ } ^\circ 23' 40'' \text{ Calmar } 1 \text{ } ^\circ 58' \text{ C.} \\ 4 \text{ } 13' 41'' = \text{D. M. } 0 \text{ } 51' \text{ T.} \end{array}$$

$$\begin{array}{r} 13 \text{ } 37' 21'' \\ 13 \text{ } 38' 25'' \end{array} \text{ Tranquebar.}$$

$$0 \text{ } 1' 4''$$

$$\text{Par.} = 8''.12$$

The results are set down in the following table.

	Stok.	Upfal.	Torn.	Cajan.	Tobo.	Abo.	Calm.	Hern	Calcu.	Mean.
Paris.	8.70	8.60	7.92	8.43	8.60	9.03	8.63	8.42	7.83	8.46
Greenwich.	9.66	9.61	8.42	9.09	9.11	10.04	10.16	9.20	8.62	9.32
Savile-Houfe.	8.50	8.50	7.75	8.50	8.66	9.04	8.50	8.16	7.54	8.36
Bologna.	8.65	8.35	8.23	8.44	8.58	8.71	8.31	8.36	8.28	8.43
Madrafs.	10.33	10.15	8.90	9.71	9.54	10.48	10.80	9.77	9.32	9.89
Grand Mount.	8.07	7.77	7.35	8.07	8.34	8.31	7.50	7.52	6.96	7.76
Tranquebar.	8.50	8.23	7.68	8.36	8.55	8.67	8.12	7.96	7.47	8.17
Sun's Par, mean.	8.91	8.75	8.03	8.66	8.77	9.18	8.86	8.48	8.00	8.63

The mean of these 63 results gives the Sun's parallax = $8''.63$; and if we reject all those which differ more than one second from the mean of the whole the mean of the remaining 49 results gives the Sun's parallax = $8''.50$.

And if we reject all those which differ more than half a second from the mean of the whole, the mean of the remaining 37 results gives the Sun's parallax = $8''.535$; the mean therefore of these three means gives the Sun's parallax = $8''.55$.

Thus

Thus by the mean of 53 comparisons the Sun's parallax is determined to be $= 8', 58$, and by the mean of 63 comparisons the Sun's parallax is determined to be $= 8'', 55$. The mean of these two means gives $8'', 565$ for the parallax of the Sun on the day of the transit.

It may be objected, that this determination cannot be depended on to a very great precision, because the greatest difference of the effect of the parallaxes in any of these comparisons does not exceed $3' 31''$: consequently that this is too small a base, from which we can expect any great exactness in the determination of the Sun's parallax: But if we consider the great number of comparisons (no less than 116), the certainty of the differences of longitude of most of the places of observation, and the small differences in the results themselves, I cannot help thinking that the force of this objection is in some measure removed; and that this determination of the Sun's parallax, by the observations at places on this side of the *Line* only, must be very near the truth.

In order, therefore, to remove the force of this objection entirely, let us next consider the observation at the Cape of Good Hope, by which we shall have a base very near three times greater than the former, and also the observation at Rodrigues, by which the base is nearly double of the former. But before I proceed I must take notice, that, in the *Memoir*, by M. Pingré, before mentioned, the time of the internal contact at the egress at Rodrigues is set down at $0^h 36' 49''$. But in the same volume there is an account of M. Pingré's observation sent to the R. Academy before his arrival in Europe, and the

time of the internal contact is therein set down at $0^h 34' 47''$. Also in a letter from him to the R. Society, on his arrival in Europe at Lisbon, and dated the 6th of March 1762, and which letter is printed in the Phil. Transactions, vol. LII. part I. the time of the internal contact is therein set down at $0^h 34' 47''$ true time. In another letter from him at Lisbon to the Royal Society, dated the 14th of March 1762, the time of the internal contact is again set down at $0^h 34' 47''$ true time, and he ends this letter in these words, “ Notez que l’attouchement interne des Bords s’est faite à $0^h 34' 47'$. Je fais cette remarque, parceque, vû la proximité de prononciation, qui dans notre langue est entre 30 and 40, celle attouchement se trouvoit marqué $10''$ plutot qu’il ne devoit l’être, dans une copie que j’ai faite pour mon usage; cette erreur aura *peut etre* passé dans quelque autre copie. Mais, selon l’original, il faut absolument lire $0^h 34' 47''$. M. Pingré has no where, that I can find, in the said memoir given any reason for this alteration of the time of the contact. If the internal contact at the egress at Rodrigues happened at $0^h 34' 47''$, and if this is compared with the same observation at Tobolsk the parallax of the Sun comes out $= 7'', 36$. If the time of the contact at Rodrigues was at $0^h 35' 47''$, and if this is compared with the same observation at Tobolsk, then the parallax of the Sun is found $= 8'', 62$. Again if the time of the contact at Rodrigues was at $0^h 36' 49''$, and if this is compared with the observation at Tobolsk, the parallax of the Sun will be found $= 9'', 93$. But to return.

M. Pingré, in his letter to the Royal Society dated at Lisbon the 14th of March 1762, sets down the time of the internal contact at the egress at $0^h 34' 47''$ true

true time, and with regard to the time of the external contact expresses himself thus “à $0^h 53' 18''$ le soleil a paru pendant 3 ou 4 secondes. Je n’ai pas vu le disque du soleil bien fermé, il me paroissoit un peu altéré au lieu de la sortie de Venus. M. Thuillier ne voyoit rien avec la Lunette de 9 peids. J’ai de la peine à me persuader que Venus soit sortie plutot.” It is plain from these words that M. Pingré believed that the external contact did not happen before $0^h 53' 18''$. This being allowed, let us compute the duration of the egress at Rodrigues, which we shall find $= 17' 55''$. It follows, therefore, that the internal contact happened at $0^h 35' 23''$. But this supposes that the observer could see the very last contact of Venus with the Sun’s limb, the contrary of which I have shewn in a former paper on this subject. We are therefore certain that the external contact happened later than $0^h 53' 18''$, by several seconds, consequently the internal contact happened later than $0^h 35' 23''$ by several seconds. Upon the whole, therefore, we may safely conclude that there is a mistake of one minute in setting down the time of the internal contact at the egress at Rodrigues, and that, instead of $0^h 34' 47''$, it should be $0^h 35' 47''$. This sort of mistake has happened several times in the observations of this transit, but they are easily discovered.

I shall now proceed to compare the observation of the internal contact at the Cape, with the observation of the same contact at Rodrigues and at 20 places to the north of the *Line*, and also the observation at Rodrigues with the same 20 places, and they are as follow.

[320]

$$\begin{array}{r} \overset{h}{9} \overset{\prime}{39} \overset{''}{50} \text{ Cape } \overset{\prime}{6} \overset{''}{8} \text{ C.} \\ \hline \overset{o}{2} \overset{\prime}{59} \overset{''}{7} = \text{D.M. } \overset{\prime}{2} \overset{''}{59} \text{ R.} \\ \hline \overset{h}{12} \overset{\prime}{38} \overset{''}{57} \qquad \qquad \overset{\prime}{3} \overset{''}{9} \\ \hline \overset{h}{12} \overset{\prime}{35} \overset{''}{47} \text{ Rodrigues.} \\ \hline \overset{o}{0} \overset{\prime}{3} \overset{''}{10} \\ \hline \text{Par.} = 8''.54 \end{array}$$

$$\begin{array}{r} \overset{h}{9} \overset{\prime}{39} \overset{''}{50} \text{ Cape } \overset{\prime}{6} \overset{''}{8} \text{ C.} \\ \hline \overset{h}{1} \overset{\prime}{4} \overset{''}{19} = \text{D.M. } \overset{\prime}{0} \overset{''}{53} \text{ P.} \\ \hline \overset{h}{8} \overset{\prime}{35} \overset{''}{31} \qquad \qquad \overset{\prime}{7} \overset{''}{1} \\ \hline \overset{h}{8} \overset{\prime}{28} \overset{''}{27} \text{ Paris.} \\ \hline \overset{o}{0} \overset{\prime}{7} \overset{''}{4} \\ \hline \text{Par.} = 8''.56 \end{array}$$

$$\begin{array}{r} \overset{h}{6} \overset{\prime}{39} \overset{''}{50} \text{ Cape } \overset{\prime}{6} \overset{''}{8} \text{ C.} \\ \hline \overset{o}{0} \overset{\prime}{28} \overset{''}{14} = \text{D.M. } \overset{\prime}{0} \overset{''}{29} \text{ B.} \\ \hline \overset{h}{9} \overset{\prime}{11} \overset{''}{36} \qquad \qquad \overset{\prime}{6} \overset{''}{37} \\ \hline \overset{h}{9} \overset{\prime}{4} \overset{''}{57} \text{ Bologna.} \\ \hline \overset{o}{0} \overset{\prime}{6} \overset{''}{39} \\ \hline \text{Par.} = 8''.54 \end{array}$$

$$\begin{array}{r} \overset{h}{9} \overset{\prime}{39} \overset{''}{50} \text{ Cape } \overset{\prime}{6} \overset{''}{8} \text{ C.} \\ \hline \overset{o}{0} \overset{\prime}{23} \overset{''}{42} = \text{D.M. } \overset{\prime}{0} \overset{''}{13} \text{ R.} \\ \hline \overset{h}{9} \overset{\prime}{16} \overset{''}{8} \qquad \qquad \overset{\prime}{6} \overset{''}{21} \\ \hline \overset{h}{9} \overset{\prime}{9} \overset{''}{36} \text{ Rome.} \\ \hline \overset{o}{0} \overset{\prime}{6} \overset{''}{32} \\ \hline \text{Par.} = 8''.74 \end{array}$$

$$\begin{array}{r} \overset{h}{9} \overset{\prime}{39} \overset{''}{50} \text{ Cape } \overset{\prime}{6} \overset{''}{8} \text{ C.} \\ \hline \overset{o}{0} \overset{\prime}{29} \overset{''}{31} = \text{D.M. } \overset{\prime}{0} \overset{''}{24} \text{ F.} \\ \hline \overset{h}{9} \overset{\prime}{10} \overset{''}{19} \qquad \qquad \overset{\prime}{6} \overset{''}{32} \\ \hline \overset{h}{9} \overset{\prime}{3} \overset{''}{28} \text{ Florence.} \\ \hline \overset{o}{0} \overset{\prime}{6} \overset{''}{51} \\ \hline \text{Par.} = 8''.91 \end{array}$$

$$\begin{array}{r} \overset{h}{9} \overset{\prime}{39} \overset{''}{50} \text{ Cape } \overset{\prime}{6} \overset{''}{8} \text{ C.} \\ \hline \overset{o}{0} \overset{\prime}{34} \overset{''}{3} = \text{D.M. } \overset{\prime}{1} \overset{''}{18} \text{ G.} \\ \hline \overset{h}{9} \overset{\prime}{5} \overset{''}{47} \qquad \qquad \overset{\prime}{7} \overset{''}{26} \\ \hline \overset{h}{8} \overset{\prime}{58} \overset{''}{26} \text{ Gottingen.} \\ \hline \overset{o}{0} \overset{\prime}{7} \overset{''}{21} \\ \hline \text{Par.} = 8''.40 \end{array}$$

$$\begin{array}{r} \overset{h}{9} \overset{\prime}{39} \overset{''}{50} \text{ Cape } \overset{\prime}{6} \overset{''}{8} \text{ C.} \\ \hline \overset{h}{1} \overset{\prime}{13} \overset{''}{35} = \text{D.M. } \overset{\prime}{1} \overset{''}{12} \text{ G.} \\ \hline \overset{h}{8} \overset{\prime}{26} \overset{''}{15} \qquad \qquad \overset{\prime}{7} \overset{''}{20} \\ \hline \overset{h}{8} \overset{\prime}{19} \overset{''}{0} \text{ Greenwich.} \\ \hline \overset{o}{0} \overset{\prime}{7} \overset{''}{15} \\ \hline \text{Par.} = 8''.40 \end{array}$$

$$\begin{array}{r} \overset{h}{9} \overset{\prime}{39} \overset{''}{50} \text{ Cape } \overset{\prime}{6} \overset{''}{8} \text{ C.} \\ \hline \overset{h}{1} \overset{\prime}{14} \overset{''}{5} = \text{D.M. } \overset{\prime}{1} \overset{''}{11} \text{ S.H.} \\ \hline \overset{h}{8} \overset{\prime}{25} \overset{''}{45} \qquad \qquad \overset{\prime}{7} \overset{''}{19} \\ \hline \overset{h}{8} \overset{\prime}{18} \overset{''}{22} \text{ Savile-House.} \\ \hline \overset{o}{0} \overset{\prime}{7} \overset{''}{23} \\ \hline \text{Par.} = 8''.57 \end{array}$$

[321]

$\begin{array}{r} h \\ 9 \ 39 \ 50 \\ 1 \ 32 \ 7 \end{array}$ Cape $\begin{array}{r} 6 \ 8 \ C. \\ 1 \ 4 \ L. \end{array}$
 $= D.M. \ 1 \ 4 \ L.$

$\begin{array}{r} 8 \ 7 \ 43 \\ 8 \ 0 \ 21 \end{array}$ Lefkeard.

$\begin{array}{r} 0 \ 7 \ 22 \end{array}$

Par. = $8''.69$

$\begin{array}{r} h \\ 9 \ 39 \ 50 \\ 0 \ 8 \ 0 \end{array}$ Cape $\begin{array}{r} 6 \ 8 \ C. \\ 1 \ 59 \ C. \end{array}$
 $= D.M. \ 1 \ 59 \ C.$

$\begin{array}{r} 9 \ 31 \ 50 \\ 9 \ 23 \ 40 \end{array}$ Calmar.

$\begin{array}{r} 0 \ 8 \ 10 \end{array}$

Par. = $8''.55$

$\begin{array}{r} h \\ 9 \ 39 \ 50 \\ 0 \ 2 \ 23 \end{array}$ Cape $\begin{array}{r} 6 \ 8 \ C. \\ 2 \ 26 \ H. \end{array}$
 $= D.M. \ 2 \ 26 \ H.$

$\begin{array}{r} 9 \ 37 \ 27 \\ 0 \ 28 \ 52 \end{array}$ Hernofand.

$\begin{array}{r} 0 \ 8 \ 35 \end{array}$

Par. = $8''.51$

$\begin{array}{r} h \\ 9 \ 39 \ 50 \\ 0 \ 3 \ 8 \end{array}$ Cape $\begin{array}{r} 6 \ 8 \ C. \\ 2 \ 21 \ U. \end{array}$
 $= D.M. \ 2 \ 21 \ U.$

$\begin{array}{r} 9 \ 36 \ 42 \\ 9 \ 28 \ 9 \end{array}$ Upsal.

$\begin{array}{r} 0 \ 8 \ 33 \end{array}$

Par. = $8''.57$

$\begin{array}{r} h \\ 9 \ 39 \ 50 \\ 0 \ 1 \ 9 \end{array}$ Cape $\begin{array}{r} 6 \ 8 \ C. \\ 2 \ 18 \ S. \end{array}$
 $= D.M. \ 2 \ 18 \ S.$

$\begin{array}{r} 9 \ 38 \ 41 \\ 9 \ 30 \ 10 \end{array}$ Stokolm.

$\begin{array}{r} 0 \ 8 \ 31 \end{array}$

Par. = $8''.58$

$\begin{array}{r} h \\ 9 \ 39 \ 50 \\ 0 \ 14 \ 55 \end{array}$ Cape $\begin{array}{r} 6 \ 8 \ C. \\ 2 \ 30 \ A. \end{array}$
 $= D.M. \ 2 \ 30 \ A.$

$\begin{array}{r} 9 \ 54 \ 45 \\ 9 \ 45 \ 59 \end{array}$ Abo.

$\begin{array}{r} 0 \ 8 \ 46 \end{array}$

Par. = $8''.63$

$\begin{array}{r} h \\ 9 \ 39 \ 50 \\ 0 \ 37 \ 20 \end{array}$ Cape $\begin{array}{r} 6 \ 8 \ C. \\ 2 \ 59 \ C. \end{array}$
 $= D.M. \ 2 \ 59 \ C.$

$\begin{array}{r} 10 \ 17 \ 10 \\ 10 \ 7 \ 59 \end{array}$ Cajaneburg.

$\begin{array}{r} 0 \ 9 \ 11 \end{array}$

Par. = $8''.56$

$\begin{array}{r} h \\ 9 \ 39 \ 50 \\ 0 \ 23 \ 25 \end{array}$ Cape $\begin{array}{r} 6 \ 8 \ C. \\ 3 \ 5 \ T. \end{array}$
 $= D.M. \ 3 \ 5 \ T.$

$\begin{array}{r} 10 \ 3 \ 15 \\ 9 \ 54 \ 8 \end{array}$ Tornea.

$\begin{array}{r} 0 \ 9 \ 7 \end{array}$

Par. = $8''.41$

$$\begin{array}{r} \text{h} \quad \text{' } \quad \text{' } \\ 9 \quad 39 \quad 50 \quad \text{Cape} \quad \text{' } \quad \text{' } \quad \text{C.} \\ 3 \quad 19 \quad 32 = \text{D. M.} \quad 3 \quad 44 \quad \text{T.} \end{array}$$

$$\begin{array}{r} 12 \quad 59 \quad 22 \\ 12 \quad 49 \quad 23 \quad \text{Tobolfsk.} \end{array}$$

$$\begin{array}{r} 0 \quad 9 \quad 59 \end{array}$$

$$\text{Par.} = 8''.64$$

$$\begin{array}{r} \text{h} \quad \text{' } \quad \text{' } \\ 9 \quad 39 \quad 50 \quad \text{Cape} \quad \text{' } \quad \text{' } \quad \text{C.} \\ 4 \quad 40 \quad 10 = \text{D. M.} \quad 2 \quad 22 \quad \text{C.} \end{array}$$

$$\begin{array}{r} 14 \quad 20 \quad 0 \\ 14 \quad 11 \quad 34 \quad \text{Calcutta.} \end{array}$$

$$\begin{array}{r} 0 \quad 8 \quad 26 \end{array}$$

$$\text{Par.} = 8''.43$$

$$\begin{array}{r} \text{h} \quad \text{' } \quad \text{' } \\ 9 \quad 39 \quad 50 \quad \text{Cape} \quad \text{' } \quad \text{' } \quad \text{C.} \\ 4 \quad 6 \quad 43 = \text{D. M.} \quad 0 \quad 59 \quad \text{M.} \end{array}$$

$$\begin{array}{r} 13 \quad 46 \quad 33 \\ 13 \quad 39 \quad 38 \quad \text{Madrafs.} \end{array}$$

$$\begin{array}{r} 0 \quad 6 \quad 55 \end{array}$$

$$\text{Par.} = 8''.28$$

$$\begin{array}{r} \text{h} \quad \text{' } \quad \text{' } \\ 9 \quad 39 \quad 50 \quad \text{Cape} \quad \text{' } \quad \text{' } \quad \text{C.} \\ 4 \quad 5 \quad 58 = \text{D. M.} \quad 0 \quad 59 \quad \text{G. M.} \end{array}$$

$$\begin{array}{r} 13 \quad 45 \quad 48 \\ 13 \quad 38 \quad 30 \quad \text{Grand Mount.} \end{array}$$

$$\begin{array}{r} 0 \quad 7 \quad 18 \end{array}$$

$$\text{Par.} = 8''.70$$

$$\begin{array}{r} \text{h} \quad \text{' } \quad \text{' } \\ 9 \quad 39 \quad 50 \quad \text{Cape} \quad \text{' } \quad \text{' } \quad \text{C.} \\ 4 \quad 5 \quad 41 = \text{D. M.} \quad 0 \quad 51 \quad \text{M.} \end{array}$$

$$\begin{array}{r} 13 \quad 45 \quad 31 \\ 13 \quad 38 \quad 25 \quad \text{Tranquebar.} \end{array}$$

$$\begin{array}{r} 0 \quad 7 \quad 6 \end{array}$$

$$\text{Par.} = 8''.60$$

Rodrigues and the following places compared together.

$$\begin{array}{r} \text{h} \quad \text{' } \quad \text{' } \\ 12 \quad 35 \quad 47 \quad \text{Rodr.} \quad \text{' } \quad \text{' } \quad \text{R.} \\ 4 \quad 3 \quad 26 = \text{D. M.} \quad 0 \quad 53 \quad \text{P.} \end{array}$$

$$\begin{array}{r} 8 \quad 32 \quad 21 \\ 8 \quad 28 \quad 27 \quad \text{Paris.} \end{array}$$

$$\begin{array}{r} 0 \quad 3 \quad 54 \end{array}$$

$$\text{Par.} = 8''.58$$

$$\begin{array}{r} \text{h} \quad \text{' } \quad \text{' } \\ 12 \quad 35 \quad 47 \quad \text{Rodr.} \quad \text{' } \quad \text{' } \quad \text{R.} \\ 3 \quad 27 \quad 21 = \text{D. M.} \quad 0 \quad 29 \quad \text{B.} \end{array}$$

$$\begin{array}{r} 9 \quad 8 \quad 26 \\ 9 \quad 4 \quad 57 \quad \text{Bologna.} \end{array}$$

$$\begin{array}{r} 0 \quad 3 \quad 29 \end{array}$$

$$\text{Par.} = 8''.54$$

[323]

12 35 47 Rodr. 2 59 R.
3 22 49 = D. M. 0 13 R.

9 12 58 3 12
9 9 36 Rome.

0 3 22

$$\text{Par.} = 8''.94$$

12 35 47 Rodr. 2 59 R.
3 28 38 = D. M. 0 24 F.

9 7 9 3 23
9 3 28 Florence.

0 3 41

Par. = " 24

h / // ' // ' //

12 35 47 Rodr. 2 59 R.
3 33 10 = D. M. 1 18 G.

9 2 37 4 17
8 58 26 Gottingen.

O 4 II

Par. = 8. 30

12 35 47 Rodr. 2 59 R.
4 12 42 = D. M. 1 12 G.

8 23 5 4 II
8 19 0 Greenwich.

0 4 5

Par. = 8. 33

12 35 47 Rodr. 2 59 R.
4 13 12 = D. M. 1 11 S.H.

8 22 35 4 10
8 18 22 Savile-House.

0 4 13

Par. = 8.59

$$\begin{array}{ccccccc} 12 & 35 & 47 & \text{Rodr.} & 2 & 59 & \text{R.} \\ 4 & 31 & 14 & = \text{D. M.} & 1 & 4 & \text{L.} \end{array}$$

8 4 33 4 3
8 0 21 Leskeard.

0 4 12

$$\text{Par.} = 8.81$$

12 35 47 Rodr. 2 59 R.
3 7 7 = D. M. 1 59 C.

9 28 40 4 58
9 23 40 Calmar.

0 5 0

Par. = 8. 56

12 35 47 Rodr. 2 59 R.
3 1 30 = D. M. 2 26 H.

9 34 17 5 25
9 28 52 Hernofand.

0 5 25

Par. = 8'. 50

$\begin{array}{r} h \\ 12 \end{array} \begin{array}{r} ' \\ 35 \end{array} \begin{array}{r} '' \\ 47 \end{array} \text{ Rodr. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ R.} \\ \underline{\quad \quad \quad} \\ 3 \quad 2 \quad 15 = \text{D. M. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 21 \end{array} \text{ U.}$

$\begin{array}{r} 9 \quad 33 \quad 32 \\ 9 \quad 28 \quad 9 \end{array} \text{ Upfal.} \quad \begin{array}{r} 5 \quad 20 \end{array}$

$\begin{array}{r} 0 \quad 5 \quad 23 \end{array}$

Par. = $8''.58$

$\begin{array}{r} h \\ 12 \end{array} \begin{array}{r} ' \\ 35 \end{array} \begin{array}{r} '' \\ 47 \end{array} \text{ Rodr. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ R.} \\ \underline{\quad \quad \quad} \\ 3 \quad 0 \quad 16 = \text{D. M. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 18 \end{array} \text{ S.}$

$\begin{array}{r} 9 \quad 35 \quad 31 \\ 9 \quad 30 \quad 11 \end{array} \text{ Stokolm.} \quad \begin{array}{r} 5 \quad 17 \end{array}$

$\begin{array}{r} 0 \quad 5 \quad 20 \end{array}$

Par. = $8''.58$

$\begin{array}{r} h \\ 12 \end{array} \begin{array}{r} ' \\ 35 \end{array} \begin{array}{r} '' \\ 47 \end{array} \text{ Rodr. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ R.} \\ \underline{\quad \quad \quad} \\ 2 \quad 44 \quad 12 = \text{D. M. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 30 \end{array} \text{ A.}$

$\begin{array}{r} 9 \quad 51 \quad 35 \\ 9 \quad 45 \quad 59 \end{array} \text{ Abo.} \quad \begin{array}{r} 5 \quad 29 \end{array}$

$\begin{array}{r} 0 \quad 5 \quad 36 \end{array}$

Par. = $8''.68$

$\begin{array}{r} h \\ 12 \end{array} \begin{array}{r} ' \\ 35 \end{array} \begin{array}{r} '' \\ 47 \end{array} \text{ Rodr. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ R.} \\ \underline{\quad \quad \quad} \\ 2 \quad 21 \quad 47 = \text{D. M. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ C.}$

$\begin{array}{r} 10 \quad 14 \quad 0 \\ 10 \quad 7 \quad 59 \end{array} \text{ Cajaneburg.} \quad \begin{array}{r} 5 \quad 58 \end{array}$

$\begin{array}{r} 0 \quad 6 \quad 1 \end{array}$

Par. = $8''.57$

$\begin{array}{r} h \\ 12 \end{array} \begin{array}{r} ' \\ 35 \end{array} \begin{array}{r} '' \\ 47 \end{array} \text{ Rodr. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ R.} \\ \underline{\quad \quad \quad} \\ 2 \quad 35 \quad 42 = \text{D. M. } \begin{array}{r} ' \\ 3 \end{array} \begin{array}{r} '' \\ 5 \end{array} \text{ T.}$

$\begin{array}{r} 10 \quad 0 \quad 5 \\ 9 \quad 54 \quad 8 \end{array} \text{ Tornea.} \quad \begin{array}{r} 6 \quad 4 \end{array}$

$\begin{array}{r} 0 \quad 5 \quad 57 \end{array}$

Par. = $8''.33$

$\begin{array}{r} h \\ 12 \end{array} \begin{array}{r} ' \\ 35 \end{array} \begin{array}{r} '' \\ 47 \end{array} \text{ Rodr. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ R.} \\ \underline{\quad \quad \quad} \\ 0 \quad 20 \quad 25 = \text{D. M. } \begin{array}{r} ' \\ 3 \end{array} \begin{array}{r} '' \\ 44 \end{array} \text{ T.}$

$\begin{array}{r} 12 \quad 56 \quad 12 \\ 12 \quad 49 \quad 23 \end{array} \text{ Tobolsk.} \quad \begin{array}{r} 6 \quad 43 \end{array}$

$\begin{array}{r} 0 \quad 6 \quad 49 \end{array}$

Par. = $8''.62$

$\begin{array}{r} h \\ 12 \end{array} \begin{array}{r} ' \\ 35 \end{array} \begin{array}{r} '' \\ 47 \end{array} \text{ Rodr. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ R.} \\ \underline{\quad \quad \quad} \\ 1 \quad 41 \quad 3 = \text{D. M. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 22 \end{array} \text{ C.}$

$\begin{array}{r} 14 \quad 16 \quad 50 \\ 14 \quad 11 \quad 34 \end{array} \text{ Calcutta.} \quad \begin{array}{r} 5 \quad 21 \end{array}$

$\begin{array}{r} 0 \quad 5 \quad 16 \end{array}$

Par. = $8''.37$

$\begin{array}{r} h \\ 12 \end{array} \begin{array}{r} ' \\ 35 \end{array} \begin{array}{r} '' \\ 47 \end{array} \text{ Rodr. } \begin{array}{r} ' \\ 2 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ R.} \\ \underline{\quad \quad \quad} \\ 1 \quad 7 \quad 36 = \text{D. M. } \begin{array}{r} ' \\ 0 \end{array} \begin{array}{r} '' \\ 59 \end{array} \text{ M.}$

$\begin{array}{r} 13 \quad 43 \quad 23 \\ 13 \quad 39 \quad 38 \end{array} \text{ Madrafs.} \quad \begin{array}{r} 3 \quad 58 \end{array}$

$\begin{array}{r} 0 \quad 3 \quad 45 \end{array}$

Par. = $8''.03$

^h 12 ['] 35 ["] 47	Rodr. ['] 2 ["] 59	R.	^h 12 ['] 35 ["] 47	Rodr. ['] 2 ["] 59	R.
<u>1</u> <u>6</u> <u>51</u>	= D.M.	<u>0</u> <u>59</u>	<u>1</u> <u>6</u> <u>34</u>	= D.M.	<u>0</u> <u>51</u>
		G.M.			T.
13 42 38		3 58	13 42 21		3 50
13 38 30	Grand Mount.		13 38 25	Tranquebar.	
<u>0</u> <u>4</u> <u>8</u>			<u>0</u> <u>3</u> <u>56</u>		
	Par. = 8". 85			Par. = 8". 74	

The results of the Sun's parallax from these several comparisons are as follow.

Sun's Parallax.	Sun's Parallax.
Cape of G. Hope and Rodrigues = 8". 54	Rodrigues and Cape of G. Hope = 8". 54
Paris - - = 8. 56	Paris - - = 8. 58
Bologna - - = 8. 54	Bologna - - = 8. 54
Rome - - = 8. 74	Rome - - = 8. 94 r.
Florence - - = 8. 91 r.	Florence - - = 9. 24 r.
Gottingen - - = 8. 40	Gottingen - - = 8. 30 r.
Greenwich - - = 8. 40	Greenwich - - = 8. 33 r.
Savile-House = 8. 57	Savile-House = 8. 59
Leskeard - - = 8. 69	Leskeard - - = 8. 81 r.
Calmar - - = 8. 55	Calmar - - = 8. 56
Hernofand - - = 8. 51	Hernofand - - = 8. 50
Upsal - - = 8. 57	Upsal - - = 8. 58
Stokolm - - = 8. 58	Stokolm - - = 8. 58
Abo - - = 8. 63	Abo - - = 8. 68
Cajaneburg - - = 8. 59	Cajaneburg = 8. 57
Tornea - - = 8. 41	Tornea - - = 8. 33 r.
Tobolsk - - = 8. 64	Tobolsk - - = 8. 62
Calcutta - - = 8. 43	Calcutta - - = 8. 37
Madrafs - - = 8. 28 r.	Madrafs - - = 8. 03 r.
G. Mount = 8. 70	G. Mount - - = 8. 85 r.
Tranquebar = 8. 60	Tranquebar = 8. 74

The mean of the 21 comparisons with the observation at the Cape, gives the Sun's parallax = 8", 56. There are only two of these 21 comparisons, marked with the letter r, which differ more than $\frac{2}{10}$ of a second from the mean of the whole; let these be rejected, and the mean of the remaining 19 results gives the Sun's parallax = 8", 56.

If we select out of these 21 comparisons those places whose difference of longitude may be supposed to be the best determined, the mean of these may be regarded as the most exact determination, viz. Paris, Bologna, Greenwich, Savile-House, Upsal, Stokolm, Cajaneburg and Tobolsk; the mean of these gives the Sun's parallax $= 8'', 55$, and if we leave out the results of Greenwich and Tobolsk, which differ the most from the rest, the mean of the remaining 6 results gives it $= 8'', 56$ the same as before.

The mean of the 21 comparisons with the observation at Rodrigues gives the Sun's parallax $= 8'', 57$, and if we reject 8 of them, which are marked with the letter *r*, and which differ more than $\frac{2}{10}$ of a second from the mean of the whole, the mean of the remaining 13 results gives the Sun's parallax $8'', 57$, differing only one hundredth part of a second from that which was determined from the observation at the Cape, and agreeing in a most surprizing manner with what was formerly determined by the comparisons of the the observations at places on this side of the *Line* only, where the base was so small, as I said before; a most convincing proof of the great precision with which the parallax of the Sun is determined by the late transit of Venus.

We shall now enquire into the limits of the error that may attend the determination of the parallax by the observation of the internal contact. An error of $1' 10''$ of time in the observation at Tobolsk when compared with the observation at the Cape, will produce an error of $1''$ in the Sun's parallax: and if we suppose an error of $35''$ of time in the observation

vation at Tobolsk, and an error of the same quantity in the observation at the Cape, and both in contrary directions, this also will produce an error of only $1''$ in the Sun's parallax. If therefore no greater error could be committed in the observations at Tobolsk and the Cape, we are certain that the comparison of Tobolsk and the Cape gives the Sun's parallax so exact, that the error does not exceed one second from the true parallax. But this is too great an error to be supposed in the observations, because I have shewn, in my former paper, that an error of only $6''$ in time was committed in the observation of the contact by persons observing even in the same place; therefore, if we suppose an error of $6''$ of time in the observation at Tobolsk, and an error of the same quantity in the observation at the Cape, and both in contrary directions, the error produced in the parallax by those $12''$, will amount only to $\frac{1}{6}$ of a second, even though we had only these two observations to determine the Sun's parallax: But since we have a great number of very good observations, made at other places, it follows that the mean of all these, must give the Sun's parallax to a less error than $\frac{1}{6}$ of a second, and consequently very near the truth.

In all places where the internal contact at the egress was observed, and where there were more observers than one, we find a difference in the time of each observer; the observation at Greenwich is an exception to this, as the three observers all agree to the same second, in the observation of the contact of Venus with the Sun's limb; which is the more surprising as they used telescopes of different construc-

tions and of different magnifying powers. This coincidence not only surprized me, but also the reverend Mr. Hornsby, now Savilian professor of Astronomy at Oxford. Mr. Hornsby went to Greenwich in the beginning of the year 1762, and on his return told me, that his surprize was at an end, for he had been informed at Greenwich, that Mr. Green, the assistant observer there, as soon as he judged that the internal contact was formed, called out *now*. This must certainly have caused some disturbance to the other observers, and might possibly influence their judgment: and the fact (as I am informed) was that each observer had a second watch in his hand, and they instantly stoped their watches, each having his hand at his watch ready to stop. This problem, therefore, is easily solved, and the surprize at the coincidence entirely vanishes; so that this observation can be looked on as no more than the observation of one person, and he too not much practised in observing. Moreover it is proper I should observe that another person was present at this observation, who confirmed the above account.

The very near coincidence of the three observers at Greenwich, in the time of the external contact remains now to be accounted for. Mr. Green did not call out at this time, because he was forbid by Dr. Bradley, who was present, though not in a condition to observe because of his bad state of health. This problem therefore may be solved in the following manner. The observation of the external contact was undoubtedly more uncertain than the former, and yet we find two of the observers agreeing to the same second, and the third differing only one second from them. If we attend to the following circumstances,

stances, we shall be immediately satisfied by them. Each observer had a second-watch in his hand; the three observers were at the same window of the same room, one of them on the leads immediately without the window, and the other two within the window; therefore each observer was within hearing and seeing of each other; consequently the instant one of the observers stopped his watch, may it not be presumed that the noise of the nicking of it might be heard by the rest? especially as there was a profound silence during the time of the observation.

I have thought proper to take notice of these facts, because several persons both at home and abroad have expressed their surprize at this coincidence, and that such an exactness may not be established as a precedent in these sort of observations; and because I think it essentially necessary, in all sorts of observations, especially in one of so much importance in astronomy as this, that every the minutest circumstance should be particularly related.

We are now to find the limits of the error arising from the difference of longitude between Tobolsk and the Cape. I find that an error of $1' 10''$ in time in the difference of longitude between these two places will cause an error of $1''$ in the Sun's parallax. But as we are certain that this error in longitude does not take place; therefore we are certain that the error in the parallax is within one second of the truth. The difference of longitude between the Cape of Good Hope and Paris is determined, both by the observations of M. de la Caille and Mr. Maſon; the difference of longitude between Paris and Upsal in Sweden is settled by the observations of Jupiter's

piter's first satellite, and the difference of longitude between Upsal and Tobolsk is settled, by the observations of the contact at the ingress at both places, by the method of M. Pingré above mentioned. Therefore the difference of longitude between the Cape and Tobolsk is very exactly settled, so exactly, that I am persuaded that the error does not amount to 5 or 6 seconds. Therefore the error in the parallax arising from the error of the difference of longitude is extremely small, scarcely amounting to $\frac{1}{12}$ part of a second. Therefore we are certain that the error in the sun's parallax arising both from the error of observation and the error of longitude does not exceed $\frac{1}{4}$ of a second in the comparison of the observations of the internal contact at Tobolsk and at the Cape, even though we had no more observations to determine the Sun's parallax; but the mean of a great many more must bring it very near the truth.

I now proceed to determine the parallax of the Sun from the total durations observed at different places. If therefore we compare the durations observed at Tobolsk, Cajaneburg, Abo, and Tornea, with the durations observed at Madras, Grand Mount and Tranquebar, which give the greatest differences, the results of the Sun's parallax will be as follow.

	Sun's Par.	Difference of duration.
Tobolsk and Madrafs - - =	9. 61	2 50
G. Mount =	8. 33	2 27
Tranquebar =	8. 52	2 40
Cajaneburg and Madrafs =	10. 09 <i>r.</i>	1 49
G. Mount =	8. 00	1 26
Tranquebar =	8. 33	1 39
Abo and Madrafs - - - =	10. 66 <i>r.</i>	1 34
G. Mount =	8. 33	1 11
Tranquebar =	8. 60	1 24
Tornea and Madrafs - - =	9. 20	1 34
G. Mount - =	7. 00 <i>r.</i>	1 11
Tranquebar =	7. 50 <i>r.</i>	1 24

The mean of these 12 results gives the Sun's parallax = 8'', 68, and if we reject four of them, which are marked with the letter *r*, and which differ the most from the rest, the mean of the remaining 8 gives the Sun's parallax = 8'', 61.

This determination of the Sun's parallax cannot be depended on to any great precision, because of the small differences between the durations compared, the greatest of which amounts only to 2' 50'', and also because of the small number of comparisons. It serves only to shew nearly what is the quantity of the Sun's parallax.

We are now to determine the limits of the error in the determination of the Sun's parallax by the durations observed at two different places. The greatest difference of duration is between Tobolsk and Madrafs, which amounts only to 2' 50''. If therefore

an error of $20''$ in time is committed in the observations of the ingress and egress at both the places compared, this error of $20''$ in time will cause an error of $1''$ in the result of the Sun's parallax, and in the comparisons of those places where the difference of duration is less, will occasion a greater error, and therefore the determination of the parallax, by this method, cannot be depended on to any great exactness, because of the small differences of the durations compared. In this method, however, we are free from the uncertainty arising from the difference of longitude not being exactly known.

I now proceed to the determination of the Sun's parallax by the least distance of the centers. There are come to my hands only two measurements of the greatest distance of the limbs of the Sun and Venus, one at Tobolsk and the other at Rodrigues. I shall only consider the measurement at Rodrigues, because there seems to me to be some mistake in the measurement at Tobolsk. If we suppose the Sun's parallax $= 8'', 5$, then the apparent middle of the transit happened at Rodrigues at $9^h 37' 30''$. There is a measurement by M. Pingré of the greatest distance of the limbs at $9^h 38' 13''$, which is so near the middle of the transit that we may safely take this quantity, viz. $5' 54'', 6^*$, for the greatest distance of the limbs of the Sun and Venus, and especially as it is marked an exact observation. This measurement, therefore, gives the apparent least distance of the centers of the

* I all along consider the observation of M. Pingré at Rodrigues as it is printed, from his own letter, in the Philosophical Transactions.

Sun and Venus at Rodrigues $= 9' 21'', 4$. Supposing then this measurement to be exact, here follows an irrefragable argument, independent of all other methods, to prove that the parallax of the Sun is very nearly $= 8'', 5$. Let us suppose the Sun's parallax $= 10''$, and let us compute, by the following method, the apparent least distance of the centers at Tobolsk; from thence we shall find that the geocentric least distance of the centers at Tobolsk is $567'', 416$, and by the observation at Rodrigues the geocentric least distance of the centers is $= 572'', 612$, so that, on this supposition, we have two different geocentric least distances of the centers, which being absurd, it follows that the Sun's parallax is not $10''$. Again let us suppose that the Sun's parallax is $= 7''$, we shall find that the geocentric least distance of the centers by the observation at Tobolsk is $= 575'', 356$, and by the observation at Rodrigues it is $= 569'', 248$. Thus then, again, we have two different geocentric least distances of the centers, which being absurd, it follows that the parallax of the Sun is not $7''$. Again if we suppose the Sun's parallax $= 8''$ or $9''$, we shall find that the same absurdity will follow, but in these two last suppositions we shall find that the differences of the geocentric least distances of the centers are not so great as on the suppositions of $10''$ and $7''$, it therefore follows that the parallax of the Sun is less than $9''$ and more than 8 , and if we continue to reason in the same manner we shall find, that on the supposition that the Sun's parallax is $= 8'', 5$, the geocentric least distances of the centers severally found by the obser-

vation at Tobolsk and at Rodrigues is very nearly the same, consequently that the Sun's parallax is very nearly $= 8'', 5$. If we pursue this subject to a greater precision, and suppose that the measurement of the greatest distance of the limbs of the Sun and Venus, taken by M. Pingré, to be perfectly exact, and compute on true * principles the apparent least distances of the centers from the durations observed at the different places in the north (the method of which I shall afterwards give) the parallax of the Sun will come out as follows, when they are compared with that measured at Rodrigues :

Rodrigues	Cajan.	Calm.	Tobol.	Torn.	Upsal.	Stoko.	Abo.	Herno.
	8'', 60	8'', 58	8'', 65	8'', 48	8'', 60	8'', 40	8'', 63	8'', 55

The mean of these eight comparisons gives the Sun's parallax $= 8'', 56$ being the very same, as that which we found before by the comparisons of the internal contacts.

Again let us reduce the observed durations, at the following several places, to the center, on the supposition that the Sun's parallax is $= 8'', 56$ as in the following table,

Tobolsk.	Cajaneburg.	Tornea.
$\begin{array}{r} 5 \text{ } 48 \text{ } 53 = \text{Obs. Du.} \\ 0 \text{ } 9 \text{ } 6 = \text{Parallax.} \\ \hline 5 \text{ } 58 \text{ } 59 = \text{Cent. D.} \end{array}$	$\begin{array}{r} 5 \text{ } 49 \text{ } 54 = \text{Obs. Du.} \\ 0 \text{ } 8 \text{ } 8 = \text{Parallax.} \\ \hline 5 \text{ } 58 \text{ } 2 = \text{Cent. D.} \end{array}$	$\begin{array}{r} 5 \text{ } 50 \text{ } 9 = \text{Obs. Du.} \\ 0 \text{ } 8 \text{ } 3 = \text{Parallax.} \\ \hline 5 \text{ } 58 \text{ } 12 = \text{Cent. D.} \end{array}$

* I say on true principles, because I have reason to think that there is a mistake in the method given by M. Pingré in the aforesaid Memoir.

Upsal.	Stokolm.	Abo.
$\begin{array}{r} h \\ 5 \ 50 \ 26'' = \text{Obf. Du.} \\ o \ 7 \ 36'' = \text{Parallax.} \\ \hline 5 \ 58 \ 2 = \text{Cent. D.} \end{array}$	$\begin{array}{r} h \\ 5 \ 50 \ 42'' = \text{Obf. Du.} \\ o \ 7 \ 37'' = \text{Parallax.} \\ \hline 5 \ 58 \ 19 = \text{Cent. D.} \end{array}$	$\begin{array}{r} h \\ 5 \ 50 \ 9'' = \text{Obf. Du.} \\ o \ 7 \ 49'' = \text{Parallax.} \\ \hline 5 \ 57 \ 58 = \text{Cent. D.} \end{array}$
Hernofand.	Calmar.	Calcutta.
$\begin{array}{r} h \\ 5 \ 50 \ 26'' = \text{Obf. Du.} \\ o \ 7 \ 39'' = \text{Parallax.} \\ \hline 5 \ 58 \ 5 = \text{Cent. D.} \end{array}$	$\begin{array}{r} h \\ 5 \ 50 \ 39'' = \text{Obf. Du.} \\ o \ 7 \ 24'' = \text{Parallax.} \\ \hline 5 \ 58 \ 3 = \text{Cent. D.} \end{array}$	$\begin{array}{r} h \\ 5 \ 50 \ 36'' = \text{Obf. Du.} \\ o \ 7 \ 35'' = \text{Parallax.} \\ \hline 5 \ 58 \ 11 = \text{Cent. D.} \end{array}$
Madrafs.	Grand Mount.	Abo.
$\begin{array}{r} h \\ 5 \ 51 \ 43'' = \text{Obf. Du.} \\ o \ 6 \ 35'' = \text{Parallax.} \\ \hline 5 \ 58 \ 18 = \text{Cent. D.} \end{array}$	$\begin{array}{r} h \\ 5 \ 51 \ 20'' = \text{Obf. Du.} \\ o \ 6 \ 35'' = \text{Parallax.} \\ \hline 5 \ 57 \ 55 = \text{Cent. D.} \end{array}$	$\begin{array}{r} h \\ 5 \ 51 \ 33'' = \text{Obf. Du.} \\ o \ 6 \ 26'' = \text{Parallax.} \\ \hline 5 \ 57 \ 59 = \text{Cent. D.} \end{array}$

The mean of these 12 central durations gives the mean central duration = $5^h 58' 5''$; from this central duration, we shall find that the geocentric least distance of the centers is = $571''$, or $9' 31''$. Let us compare the above apparent least distance of the centers measured at Rodrigues with this geocentric least distance of the centers, and we shall find that the parallax of the Sun from thence resulting is = $8''$, 56 the same as before. These results of the parallax, arising from the comparisons of the apparent least distances of the centers, agreeing with the former determinations of the parallax by the internal contacts, are a proof of the accuracy of this measurement of the greatest distance of the limbs made by M. Pingré at Rodrigues.

There are 12 places at which the total duration was observed, three of these had a northern parallax of latitude at the middle of the transit, the other nine had a southern parallax of latitude; let the apparent least distance of the centers at each place of observation be found, by the following method, let these be compared together, and we shall have the parallax of the Sun resulting from them. For this purpose I have computed the apparent least distance of the centers at the 8 following places, and have compared them with the apparent least distance of the centers at the four following places, and from each comparison I have computed the parallax of the Sun, and they are as in the following table.

	Cajan.	Calm.	Tobol.	Tornea	Upfal.	Stoko.	Abo.	Herno.	☉'s Par. mean.
Tranquebar	8. 48	8. 45	8. 54	8. 31	8. 48	8. 20	8. 52	8. 42	8. 42
Madrafs - -	8. 79	8. 76	8. 93	8. 61	8. 79	8. 50	8. 82	8. 73	8. 74
G. Mount -	8. 42	8. 38	8. 45	8. 24	8. 42	8. 12	8. 45	8. 35	8. 35
Calcutta - -	8. 69	8. 65	8. 81	8. 43	8. 68	8. 35	8. 73	8. 61	8. 62
☉'s P. mean.	8. 59	8. 56	8. 68	8. 40	8. 59	8. 29	8. 63	8. 53	8. 53

The mean of these 32 comparisons gives the Sun's parallax = 8'', 53. This very near agreement with the former determinations is somewhat surprizing, when we consider the smallness of the base from which they are computed, the greatest scarcely exceeding 20'' of an angle; but we are also to consider, that the apparent least distance of the centers may be found, from the duration observed, to a very great exactness, and nothing affects the accuracy of it, but the errors in the observation. Let us suppose then that an error, of 6'' in time, happened in each
of

of the observations of the ingress and egress, both in contrary directions; the sum of the errors, therefore, in each comparison, will amount to $24''$ of time; this will produce an error of $1''$ of space in the apparent least distance of the centers by computation, but this error of $1''$ cannot produce an error of so much as half a second in the determination of the Sun's parallax. It therefore follows, on the above supposition of an error of $24''$ of time in the observation, that though we had no other observations of the transit of Venus than two of the above total durations, (suppose that of Cajaneburg and Madras) yet we should have been absolutely certain of the parallax of the Sun within less than an error of half a second, and therefore of course it follows, that the mean of so great a number of results must be very near the truth.

This determination of the Sun's parallax, by the least distance of the centers, is also a convincing proof that there is no mistake in the observation of Mr. Mason at the Cape, as alledged by M. Pingré, and that there must be a mistake of $1'$ in setting down the time of the internal contact at the egress at Rodrigues, notwithstanding M. Pingré, in the aforesaid memoir, prefers his observation to that of Mr. Mason, because, as he says, that after a strict examination of all the circumstances attending his observation, *he could not find any mistake in it, but also because he has proved that no mistake could possibly be committed.* In this determination of the parallax by the apparent least distance of the centers, we are not embarrassed with an exact knowledge of the difference of longitude between the places compared, which therefore
in

in some measure compensates for the smallness of the base.

The same irrefragable argument, made use of in the apparent least distance of the centers, measured at Rodrigues, to prove that the parallax of the Sun is very nearly $= 8' . 5$, may likewise be deduced from the apparent least distance of the centers, computed from the total durations observed at these 12 places, but with more certainty; because the determination of the apparent least distances of the centers from the observed total durations may be depended on to a very great precision, but the same cannot be said with regard to the apparent least distance of the centers measured at Rodrigues: For M. Pingré tells us that he used a very good micrometer fitted to a refracting telescope of nine feet focus, the object-glass of which was but an indifferent one; and we are very certain, that in measuring, with a micrometer of this sort, dark objects on a white field or ground, if the image is any way indistinct, the angle measured will be less than the true angle, and *vice versa* when a bright object is measured on a dark ground; as a proof of this remark, we find that M. Pingré measured and found the diameter of Venus, when on the Sun, $= 54'' . 7$, whereas we are certain that it was above $58''$, and therefore we may presume that the measurements of the greatest distance of the limbs might be greater than the true distance, and as a further proof of the uncertainty of the measurements made with this instrument we find that M. Pingré makes the distance of the limbs greatest, several minutes after it was past the greatest.

I shall

I shall now produce, at one view, the means of the several determinations of the Sun's parallax, by the before-mentioned three several methods, which will contain the substance of this whole paper.

1^{mo}. The mean of 116 comparisons of the internal contacts observed at places to the north of the *Line* only, gives the Sun's parallax - - - - - } = 8. 565

2^{do}. The mean of 21 comparisons of the internal contacts, with that at the Cape, gives the Sun's parallax - - - - - } = 8. 56

3^{tio}. The mean of 21 comparisons of the internal contacts with that at Rodrigues, gives the Sun's parallax - - - - - } = 8. 57

4^{to}. The mean of the comparisons of the total durations gives the Sun's parallax } = 8. 61

5^{to}. The mean of the apparent least distances of the centers compared with that measured at Rodrigues, gives the Sun's parallax - - - - - } = 8. 56

6^{to}. The mean of the apparent least distances of the centers by computation from the total durations compared together, gives the Sun's parallax - - - - - } = 8. 53

The mean of these 6 means gives the Sun's parallax - - - - - } = 8. 566

And if we reject the mean arising from the comparisons of the total durations, which is the least certain, the mean of the other 5 means gives the Sun's parallax } = 8. 557

Thus

Thus is the Sun's parallax, on the day of the transit, concluded to be $= 8''$, 56, and that from three different modes of comparing together a great number of observations variously combined; the several results so nearly coinciding that to me it seems impossible, that the mean of them all can err $\frac{1}{10}$ of a second, and that probably the error does not exceed $\frac{1}{3000}$ part of the whole quantity, as the great Dr. Halley had, many years since, confidently presaged*, and thereupon I cannot but congratulate our age and nation, particularly this society on being enabled, through the royal munificence, to send fit observers to the Cape of Good Hope, whose position affords the largest base, and consequently the safest foundation for the truth.

P. S. M. Pingré, in his aforesaid memoir, seems to think that there must be some mistake in Mr. Mason's observation at the Cape, because by comparing the observations of Jupiter's satellites made by Mr. Mason at the Cape, with those made by M. Messier at Paris, he finds the difference of longitude between these two places less by $1'$ of time, than between Paris and the observatory of M. de la Caille at the Cape, and therefore imagines that Mr. Mason's observatory was to the west of M. de la Caille's. If M. Pingré had looked into the map of the Cape by M. de la Caille, he would have seen, that, if Mr. Mason's observatory had been $1'$ of time to the west

* Ut junioribus nostris astronomis, quibus forsitan hæc observare, ob minorem ætatem, obtingere potest, viam præmonstrém, qua immensam solis distantiam, intra quingentesimam sui partem, rite dimetiri poterint. Ph. Tr. N. cccxlviii. p. 454.

of M. de la Caille's, it must have been in the ocean. I am not at all surprized to see a difference or error of 1' of time in deducing the difference of longitude between Paris and the cape, by comparing Mr. Mason's observations with those of M. Messier; for I find, in the last volume of the Memoirs for 1761, a difference of 1' 5'' between M. de la Lande and M. Messier in an immersion of the first satellite of Jupiter, both of these gentlemen observing at Paris, owing I suppose to the different goodness of the telescopes used on this occasion, for M. de la Lande says that he used an 18 foot refracter, the object-glass of which was tolerably good, and that M. Messier made use of a very good reflecter of 30 inches. If M. Pingré will take the trouble of looking into the Philosophical Transactions, vol. LII. part I. he will there find observations made at the Cape, and in Surrey-street, London, of the immersions of the first and second satellites of Jupiter with reflecting telescopes, of equal goodness, of two feet focal length, where the difference of determination of the longitude of these two places, does not exceed one second in those of the first satellite, and not above 16'' in those of the second satellite. Mr. Mason's observatory at the Cape was about half a mile to the south of M. de la Caille's, and about 10 or 12 yards to the west of the meridian of the same.

M. Pingré also seems to think that the time shewn by Mr. Mason's clock was taken from a false meridian. When M. Pingré shall read the account given by Mr. Mason of his observations at the Cape, which he says in his Memoir he has not seen, I am persuaded he will be fully satisfied, from the many e-

qual-altitudes taken by Mr. Maſon, that there can be no doubt of the times of his obſervations being found from a true meridian.

I cannot leave this ſubject without taking notice of a remarkable expreſſion in the hiſtory of the Memoirs of the R. Academy at Paris page 96, for the year 1757. It is there ſaid that the Engliſh intended to ſend an aſtronomer to North America to obſerve the tranſit of Venus (according to the plan laid down by Dr. Halley) before they ſaw the map of the tranſit by M. de L'iſle, and the authority produced for this aſſertion, are the Engliſh news papers, which, if they had underſtood the nature of theſe papers, can be no authority at all. I muſt therefore, on the beſt authority, inform the gentlemen, who are the compilers of the hiſtory of theſe memoirs, that the R. Society never once thought of ſending an obſerver to North America, even before they ſaw the map of the tranſit by M. de L'iſle.

N. B. In this paper I have employed the ſame elements as in my former paper on this ſubject, except that in reducing time to ſpace I have made uſe of 4' 0'', 03 for the horary motion of Venus in her path.

A method of determining the apparent least distance of the centers of the Sun and Venus from the observation of the total duration of the transit observed any one place, and also the geocentric least distance of the centers.

LET BCPL [Tab. XVII. Fig. 1.] represent the disk of the Sun, LSP the ecliptic, OR the geocentric path of Venus over the Sun, AD the apparent path at any place, to the north of the plane of Venus's orbit, SM the geocentric least distance of the centers, AK the parallax of latitude at the internal contact at the ingress, ND the parallax of latitude at the internal contact at the egress, Ab the parallax of longitude at the ingress, and cD the parallax of longitude at the egress. It is required to find SF, which is a perpendicular let fall from the center of the Sun on the apparent path, and from thence to find SM the geocentric least distance of the centers of the Sun and Venus.

If the parallax of longitude at the ingress retards, and the parallax of longitude at the egress accelerates, the total duration will be shortened by the sum of these two parallaxes of longitude, viz. by Ab and cD, and if we make no allowance for these parallaxes, the apparent path will appear to have been BC, consequently a perpendicular from the center of the Sun on BC will be SE, longer than the perpendicular on the true apparent path by FE. But since it is certain that the parallaxes of longitude do not depress or elevate the planet, and only alter the po-

sition of the planet in a direction perpendicular to the axis of the orbit of the planet, therefore the parallaxes of longitude, in time, are, in this case, to be added to the observed time of the total duration; in consequence of which the observed time of total duration, $bc + Ab + cD$ are $=$ to the chord described by the planet in its passage over the Sun; and if the semidiameters of the Sun and Venus are known, their difference is known, which is $=$ to the line AS ; AF , from what has been said is also known, therefore SF may be found. But this SF is not the apparent least distance of the centers, for if we compute the parallax of latitude for the apparent middle of the transit, we shall find it greater than MF , which MF is only a mean between the parallaxes of latitude at the ingress and egress. Let therefore the difference between MF and the parallax of latitude computed for the middle of the transit be added to SF , and the sum will be $=$ to the apparent least distance of the centers nearly; and if from this sum we subtract the parallax of latitude, computed for the middle of the transit, the remainder will be the geocentric least distance of the centers nearly.

A true and more ready method to find the geocentric least distance of the centers, consequently the apparent least distance of the centers at any place, where the total duration has been observed.

Reduce the total duration observed to the center, reduce the central semi-duration, in time, into space; then in the right-angled triangle SMA [Fig. 2.] or SMa , we have the two sides SA or Sa , and AM or

or aM given, therefore the third side SM may be found, therefore SM the geocentric least distance of the centers is found; and if to SM , we add or subtract the parallax of latitude for the apparent middle of the transit, the sum or difference will be the apparent least distance of the centers.

E X A M P L E.

To find the apparent least distance of the centers at Tobolsk.

The total duration observed at Tobolsk was $5^h 48' 53''$ add $9' 3''$ ($=$ to the effect of the parallaxes of longitude and latitude both for the ingresses and egresses, on the supposition that the Sun's parallax is $= 8''$, 5) to this total duration, the sum $5^h 57' 56''$ is $=$ to the central duration, consequently $2^h 58' 58''$ is $=$ the central semi-duration: reduce this time into space, and it will be found $=$ to $715'', 956 = AM$ or aM , and SA or sa ($=$ difference of the semi-diameters of the Sun and Venus) $= 916''$, therefore SM will be found $= 571'', 37 =$ the geocentric least distance of the centers of the Sun and Venus. The parallax of latitude, computed on the above supposition of the Sun's parallax, for the apparent middle of the transit at Tobolsk, will be found $= 14'', 13$, which being added to the geocentric least distance of the centers above found, the sum $585'', 50$ will be the apparent least distance of the centers at Tobolsk.